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24 July 2015

Dear Mr Anderson and Mr Roberts,

Submission on recent proposals made by SAPN, AGN, AAD, Energex and Ergon Energy

We welcome the opportunity to comment on the recent initial and revised regulatory proposals by SA PowerNetworks (**SAPN**), Australian Gas Networks (for South Australia) (**AGN**), ActewAGL gas network (**AAD**), Energex and Ergon Energy (set out in **Attachment A**). Giving stakeholders, like Jemena Electricity Networks (**JEN**), an opportunity to submit on these proposals is an important step in the price review process.

Our submission is also directly relevant to the Australian Energy Regulator's (**AER**'s) recent preliminary determinations for the South Australian and Queensland electricity distribution businesses (**Qld/SA Preliminary Determinations**).

These reviews are important to us

As the AER proceeds to make final determinations for the Qld/SA electricity distributors, and draft determinations for the SA/ACT gas distribution businesses, it will also be making preliminary determinations for the Victorian electricity distribution businesses.

The AER's approach to setting the allowed rate of return for capital and the associated value for gamma is common between gas and electricity, transmission and distribution and across the different geographies it regulates. The AER's approach to determining regulatory depreciation is also directly relevant to us, and has been raised in some of the recent proposals.

As such, the substance of the AER's final determinations for the Qld/SA electricity distributors, and draft determinations for the SA/ACT gas distribution businesses, have a direct bearing on how the AER is likely to approach the cost of capital and depreciation issues for our own Victorian electricity distribution business.

These determinations will also be made at a time when the equivalent determinations made by the AER in relation to the NSW and ACT electricity distributors and Jemena Gas Networks (**JGN**) (**NSW/ACT Final Determinations)** are the subject of appeal before the Australian Competition Tribunal (the **Tribunal**).

Our supporting rate of return and gamma expert material is similar to other networks

Much of the supporting expert material that we have submitted as part of the regulatory proposal for our own Victorian electricity distribution business was procured jointly with the businesses that are the subject of the NSW/ACT Final Determinations. We are concerned that a significant proportion of this material was not given adequate attention by the AER in those processes.

We have also jointly procured new material with the Qld/SA/ACT distribution businesses and wish to ensure that it is given due consideration. With this submission we also draw the AER's attention to certain new material that has not previously been submitted by any other party.

Our concern with how the reviews are progressing

Rate of return and gamma

As we have previously highlighted, the new national electricity rules (**rules**) adopted by the AEMC in 2012 concerning the rate of return were intended to constitute a significant reform to the pre-existing arrangements which, for the electricity sector, involved moving away from the tightly prescribed use of:

- the SL-CAPM model for establishing the allowed rate of return for equity; and
- the "on the day" method of determining the allowed rate of return for debt.

Under these rules, the AER is required to consider all the available inputs when setting the allowed rates of return for equity and debt. The rules continue to provide that gamma is a market valuation of the imputation credits that would be distributed by a benchmark firm.

In reviewing the NSW/ACT Final Determinations and Qld/SA Preliminary Determinations, and the recent proposals, we are concerned that:

- **Evidence is not being used correctly.** The determinations proceed on the basis of a misapplication and misunderstanding of the evidence before the AER concerning the risks facing the benchmark electricity distribution businesses and also that the material that the AER continues to rely upon is outdated. This leads to a significant under-estimation in these determinations of the required rate of return for equity.
- **The proposed approach will not lead to an efficient return.** The AER is approaching the task of establishing an allowed rate of return on equity in a way that is misconceived and cannot possibly result in a rate of return that is commensurate with the efficient costs of a benchmark firm nor accord with the rule requirements.

- **The trailing average is not being implemented correctly.** Although the central concept of introducing a trailing average for debt is a good one, there are a number of significant issues that need to be addressed in the way this would be implemented. Most significantly, the transitional arrangements in those determinations are inconsistent with the AER's own factual findings concerning the efficient 'hybrid' financing practices of an efficient benchmark firm. The AER's determination relies in significant part on an "NPV=0" analysis proposed by Lally that is conceptually unreasonable, factually incorrect and contrary to the rules.

- **The conceptual approach to gamma does is not right.** For gamma, the AER's "conceptual approach" is at odds with the economic principle that the energy regulatory businesses need to be given a fair market reflective return and inconsistent with the rules that define gamma as the "*value* of imputation credits". A gamma of 0.4 would materially under-compensate the businesses for the costs of equity capital that is invested in their businesses.

Many of these concerns have been raised to some degree in the recent proposals (including by JEN), but we wanted to highlight our concerns directly. **Attachment B** provides further detail.

Regulatory depreciation

Regulatory depreciation allowances are an important cash flow driver for regulated networks. The certainty and predictability of our regime requires an accurate and transparent approach to setting and varying these allowances. To this end, JEN is concerned with the AER's:

- method for calculating regulatory depreciation in its preliminary decision for SA Power Networks[1], and we have engaged Incenta to perform the attached independent review of this method—**Attachment C**; and

- process for making this material change to their depreciation calculation without any prior issues paper or workshop to transparently engage with stakeholders on this material change in regulatory practice.

If you have any questions about our submission, please contact Eli Grace-Webb at eli.grace-webb@jemena.com.au or on (03) 8544 9164.

Yours sincerely

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Jemena

[1] AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April.

Attachment A: Regulatory proposals to the AER

ActewAGL gas network, initial proposal, 30 June 2015

Australian Gas Networks, initial proposal, 1 July 2015

Energex, revised proposal, 3 July 2015

Ergon Energy, revised proposal, 3 July 2015

SA PowerNetowrks, revised proposal, 3 July 2015.

Jemena Electricity Networks (Vic) Ltd

Electricity Distribution Price Review

Regulatory proposals by ACT, QLD and SA gas and electricity networks

Public

24 July 2015

Jemena

An appropriate citation for this paper is:

Electricity Distribution Price Review

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1. INTRODUCTION

1.1 FLAWED RISK ASSESSMENT

The Qld/SA Preliminary Determinations proceed on the basis that conceptually a gearing ratio, a "beta" value within in a SL-CAPM model and a benchmark credit rating can adequately recompense the businesses for the returns required on risky investments and that a specific beta value of 0.7, and a credit rating of BBB+ are adequate for this purpose.

It is simply not the case that an adequate compensation for risk can be provided that way. We have three fundamental concerns with the AER's approach.

1.2 MISAPPLICATION OF EARLIER FRONTIER REPORT

Firstly, the AER's approach relies in significant part on a report the AER commissioned from Frontier Economics in 2013 but Frontier Economics has this year prepared an additional report (Frontier Economics, "Review of the AER's conceptual analysis for equity beta" 2015) explaining that the AER has misunderstand and misapplied the analysis it undertook in 2013.

The most significant misconception in the way the AER uses Frontier Economics' work is that the AER has wrongly equated the issue of how leveraging affects risk with the discussion by Frontier Economics of "financial risks" or "risks that have a financial dimension" and, more generally, the AER has not adequately accounted for the effect of leverage on risk. As the Frontier Report summarises:[1]

> *The fact that the precise relationship between leverage and equity beta is not known with certainty does not mean that the effect of leverage on beta should be disregarded when making comparisons between estimated equity betas. Such an approach would be at odds with accepted finance and regulatory practice.*
>
> *The "financial risks" that we considered in our 2013 report for the AER are not the same as financial leverage and do not substitute for the leverage component of equity beta. The AER appears to have misunderstood this point in our 2013 report.*
>
> *The evidence that the AER presents in relation to US utility betas supports a re-levered equity beta estimate of close to 1.*

The fundamental point is a simple one. If a business takes on substantial debt (which takes a fixed return and ranks higher than equity in priority on a liquidation), the risk for equity holders will rise significantly.

Using the language of the SL-CAPM model, Frontier finds that even though the underlying business itself may have less systematic risk than the average investment, once the additional risk of leveraging is taken into account, there is no concrete basis to conclude that the appropriate equity beta for a US regulated energy utility is below 1.0.

Some alternative models for estimating the return on equity (such as the Dividend Growth Model ("DGM")) do not explicitly contain a "beta" measure of risk. Nevertheless, the DGM accounts for risk another way in the process of selecting the relevant comparables for establishing the estimates. The fact that correctly specified DGM estimates currently deliver estimates for the return on equity that are materially higher than using a beta of

[1] Frontier, *Review of the AER's conceptual analysis for equity beta*, paragraph [10]; page 2.

0.7 in the AER's SL-CAPM Foundation Model, corroborates the primary evidence we have provided on risk that an equity of beta of 0.7 is too low.

1.3 DISRUPTIVE TECHNOLOGIES NOT ADEQUATELY ADDRESSED

Secondly, the AER has not adequately addressed the effects of disruptive technologies when setting regulatory allowances.

In the regulatory proposal for our Victorian distribution business, we have submitted detailed information on the substantial changes facing our business due to disruptive technologies that mean that the risks facing us into the future are substantially greater than they were historically. Consequently, a regulatory allowance based on a historic assessment risk will materially under compensate investors. The AER's treatment of the material that SA Power Networks submitted on this issue is inadequate.

This is a significant issue. In Frontier Economics' 2015 report it states: [2]

> *There have been developments in the roll-out and adoption of disruptive technologies since our 2013 report. There is more uncertainty about the future of the industry now than there was even two years ago, and it is not unreasonable to think that investors would take this into account when allocating scarce capital to this industry.*

Although the AER's preliminary determination for SA Power Networks acknowledged that the risk electricity distribution businesses face has significantly risen in the very recent past, it declined to make any adjustment (to the allowed return, to cash flows, or to depreciation schedules) claiming that the shortest end duration of the AER's beta studies (i.e., studies over five years) should reflect these emerging risks.

The Frontier Economics report states: [3]

> *The AER suggests that any systematic component of disruptive technology risk would be captured in its equity beta estimates. Our view is that this is very unlikely.*

The AER's response is an inadequate means to address the issue of disruptive technologies because:

1. the most recent of these five-year studies pre-dated most of the developments detailed in our regulatory proposal
2. an up-to-date five-year study would dilute the measure of these new risks in an average that partly pre-dates these developments
3. the AER's method is to blend the consideration of short duration studies with much longer duration studies which further dilutes the measurement of new risks, and
4. the majority of the firms that the AER takes to be comparators are not electricity network businesses.

The AER's preliminary determination for SA Power Networks suggests that an additional feature of the NEM regulatory structure reduces risk for the benchmark efficient firm. The AER suggests that the business is insulated from risk as there is a constrained ability for the regulator to remove assets from the regulatory asset base through "optimisation" assessments and that asset utilisation and cost recovery risks are recompensed through this form of protection for "cash flows". The AER does not have a proper basis for concluding that these

[2] Page 3

[3] Page 3

mechanisms are effective in controlling these risks particularly if the "death spiral" effect described in the SA Power Networks proposal were to occur.

The Frontier Economics report explains that: [4]

> *The AER suggests that to the extent that the risks are non-systematic in nature, those risks would more appropriately be compensated through regulated cash flows (such as accelerated depreciation of assets). However, notwithstanding that the AER recognises that disruptive technologies may increase the risks faced by NSPs, the AER has made no allowances for these risks either through the rate of return or through regulated cash flows.*

This conceptual discussion of risk reconciles with Gray and Hall's assessment[5] that the best estimate for beta for the SL-CAPM model is 0.82 (if it is used as part of a multi-model approach) or 0.91 (if the SL-CAPM is used alone and needs to be adjusted for its low-beta bias).

1.4 SL-CAPM IS DOWNWARDLY BIASED FOR LOW BETA STOCKS

Thirdly, as discussed in the next section of this submission, the SL-CAPM is acknowledged to produce downwardly biased returns for businesses with a beta of less than 1.0. This means that when the SL-CAPM is the primary model used, and an underestimate of beta of below 1.0 is used in that model, there is a compounding effect of under-compensation for the business concerned.

At the *very least*, if debate persists on the quantum of the risk facing our business, it is unequivocally the case that the business has moved in the more risky direction since the last round of regulatory determinations conducted in 2010. This is a compelling basis for concluding that the AER's approach of reducing the beta from 0.8 to 0.7 is incorrect and unreasonable and that the only direction in which the beta can be moved from 0.8 is upward.

[4] *Ibid*; [11]; page 3.

[5] SFG Consulting, 2015, Beta and the Black Capital Asset Pricing Model.

2. PROBLEMS WITH RETURN ON EQUITY APPROACH

2.1 GIVING REAL WEIGHT TO ALL THE AVAILABLE INPUTS

A significant disagreement inherent in the different ways that the AER and the businesses approach the estimation of the allowed rate of return concerns the requirement in the rules to have regard to the full range of relevant models and data available.

The Qld/SA Preliminary Determinations proceed on the basis that it is sufficient to consider all the available material and then choose to accord some relevant inputs a very substantial weight, some relevant inputs a very constrained role and other relevant inputs no role at all. By contrast, the businesses consider that the requirement to "have regard" to all the relevant material has the same meaning as in the DBNGP case.[6]

We consider that all the relevant information needs to be given a *real weight* that is proportionate to its probative merits. It is not acceptable to acknowledge that inputs are relevant and ascribe them no weight or to give such inputs a highly constrained role that does not reflect their probative value.

The AEMC's explanatory statement that accompanies the rules repeats a number of times that all the relevant material must be accorded an appropriate weight.[7] For example:[8]

> *Whether or not the estimated rate of return meets the allowed rate of return objective will invariably require some level of judgement, but this judgement should be based with reference to all relevant estimation methods, financial models, market data and other evidence that could reasonably be expected to inform a regulator's decision.*
>
> *…*
>
> *In addition, the regulator must make a judgement in the context of the overall objective as to the best method(s) and information sources to use, including what weight to give to the different methods and information in making the estimate.*

It would be a hollow exercise for the AEMC to have reformed the rules to permit a departure from the SL-CAPM, required an evaluation of all the available alternatives and then permit the decision maker to disregard models or inputs that are found to be relevant and essentially revert to the pre-existing approach.

The businesses have provided a wealth of material to explain why the other relevant equity models provide important additional insights that the SL-CAPM is unable to provide. As well as the expert views of Gray and Hall[9], there is a broad chorus of experts who corroborate the superiority of approaches that use a range of different models concurrently.

[6] re Michael AM; ex parte Epic Energy (WA) Nominees Pty Ltd & anor [2002] WASCA231 at paragraph 55.

[7] AEMC Rule Determination, 29 November 2012, Pages i, iii, 26, 27, 30,31, 48

[8] AEMC Rule Determination, 29 November 2012, Page 48

[9] SFG Consulting; *The foundation model approach of the Australian Energy Regulator to re-estimating the cost of equity, Report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA Power Networks, and United Energy*; 27 March 2015; paragraph [107]; page 22.

Dr Robert Malko, a distinguished U.S. regulatory economist with more than 40 years of relevant experience, states: [10, 11]

> ***Which models are useful for economic regulatory purposes?***
>
> *In my opinion, all of the models discussed above are useful in the determination of allowed return on equity, but each model has both strengths and drawbacks and should not be used alone, nor is any model superior so as to warrant its use as a primary or sole principal model.*
>
> *In particular, the models can be grouped into two 'families': the DGM on the one hand and all the capital asset pricing models or interest rate sensitive models on the other based on how they explain and predict returns. Both major groupings, and all the variants discussed above, provide useful insights into what returns that risk-adverse investors expect to receive when making investments.*
>
> *…*
>
> ***Multiple Model Approaches are Preferable***
>
> *In my opinion, no one single financial model is sufficient to estimate the rate of return in every economic circumstance. All models suffer a range of theoretical and/or empirical weaknesses of different kinds. If only one model is used, or if one model is given excessive pre-eminent weight, investors' returns will be highly dependent on the extent to which that model's particular weaknesses lead to over- or under-returns. If multiple models are used, then the returns will vary in response to all the weaknesses but to a smaller extent than if one model is used. It also stands to reason that where the weaknesses of different approaches are directionally different, they will to some degree cancel each other out. Additionally, where only one model is used there is insufficient corroborating evidence or ability to cross-check the results. By contrast, the consideration of multiple models enables the decision maker to either become comfortable that different methodologies are corroborative or, where they are not, to question why it is that one or more models may be delivering significant different results at a particular time or in particular economic circumstances. This, in turn, can give an insight into whether results should be adjusted (by altering the weighting or influence) according to particular models and their results.*
>
> *In my opinion, to ensure the most appropriate decision, it is important to consider the results of several models. In my opinion, using several models helps compensate for the drawbacks in any single model and increases the probability that the appropriate and reasonable range is identified.*

Ronald L. Knecht, the Chief Fiscal Officer for the state of Nevada in the United States, who is an experienced former energy regulator, agrees that an approach that employs multiple models is preferable: [12]

> *Long-term market trends will tend to drive the estimates of one model higher than another for some years and then lower for another stretch of time. This fact justifies both the use of a wide range of models and also the continuation of the same set of models through these variations.*
>
> *Using a number of different models is superior to relying on a more limited selection of models. This is because the CAPM, ECAPM, FF3F, and CA+I estimates use basic cost of capital data in a different manner to the DCF models. The CAPM, ECAPM, FF3F and CA+I models extract information from the Cost of Capital data that the DCF models miss – and vice versa. Using multiple models provides additional perspectives and information, yielding a more accurate, reliable, and robust estimate.*

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[10] *Ibid*; paragraphs [8.1-8.2]; pages 9-10.

[11] *Ibid*; paragraphs [9.1]-[9.2]; page 10.

[12] Knecht, RL; *Statement*; 19 June 2015 (**Knecht**); paragraphs [4.4-4.5]; page 3.

The Brattle Group internationally and in Australia also supports the use of multiple models: [13]

> *All models have relative strengths and weaknesses, with the result that there is no one model that is the most suitable for estimating the cost of equity at any given time or for any given company. As our colleague and MIT professor Stewart Myers has put it eloquently —Use more than one model when you can. Because estimating the opportunity cost of capital is difficult, only a fool throws away useful information.*

The Qld/SA Preliminary Determinations adopt a "foundation model" approach. That is not found in the rules or the National Electricity Law. The concept itself (i.e. that all other inputs can only contribute to the rate of return via the selection of point estimates for the foundation model's parameter ranges), and its implementation by the AER (i.e. using the SL-CAPM as the foundation model), prevent any real weight being accorded to other models and strictly circumscribe how much weight they are accorded. This is explained in detail in Gray and Hall's 2015 report titled, "The foundation model approach of the Australian Energy Regulator to estimating the cost of equity".

The foundation model approach only permits the other models to contribute to the rate of return estimate in an idiosyncratic and distorted manner. For example, the Black CAPM was conceived of as a means to arrive at a better estimate for the return on equity by freeing the SL-CAPM of an unrealistic constraint. It was conceived of as being a model that takes equity return data and directly estimates a return on equity and that is how it is used by finance practitioners. This is not the way in which the AER has taken the model into account. Instead, the AER takes inspiration from its functional form to contribute to a decision to take an upper estimate of a 'rough and ready' range of possible betas for use in the SL-CAPM. This is a completely idiosyncratic use of the Black CAPM.

Indeed, the AER has not even derived estimates for the Black CAPM nor several other relevant models. *Even if* the rule requirement to "have regard" to all the relevant inputs permits relevant information to be given no real weight (i.e. if it is adequate to "consider and discard") it simply cannot be the case that these models have been given a proper consideration without even having been implemented to produce a rate of return estimate. As we will see below, in the US where it is acceptable to adopt a primary model, at the very minimum the regulator calculates estimates using the alternative models and these estimates are considered in reaching the final decision.

Gray and Hall have instead proposed a multi-model approach that would give all the equity models weight – either equal weight or a more refined approach to how the models might be combined. This is a straightforward approach to including all the relevant inputs and it is a methodology that would produce a high degree of stability and predictability in the overall rates of return for energy businesses and their customers while continuing to be responsive to the prevailing conditions in equity markets. In their latest report on these issues titled "The required return on equity for the benchmark efficient entity" (2015), Gray and Hall have methodically addressed the latest criticisms levelled at their approach in the Qld/SA Preliminary Determinations.

We would urge the AER to discontinue the foundation model approach which is laden with complex implicit constraints on the role that any other information can play in estimating the return on equity capital.

2.2 AN UNWARRANTED PREFERENCE FOR THE SL-CAPM OVER ALL OTHER OPTIONS

Our second concern is that the AER's selection of the SL-CAPM as the foundation model appears to have been undertaken through "rose tinted glasses".

[13] Brattle Group 2013, "Estimating the Cost of Equity for Regulated Companies" page 1.

This assessment culminates in a glowing statement by the AER concerning the SL-CAPM that simply cannot be supported by the preponderance of the expert material: [14]

> *We consider there is overwhelming evidence that the SL-CAPM is the current standard bearer for estimating expected equity returns*.

The AER's evaluation of the SL-CAPM makes muted criticisms that involve:

- an inadequate acknowledgement of the flaws of the SL-CAPM[15]
- an inadequate recognition of the value that other models have in addressing flaws in the SL-CAPM,[16] and
- inadequate weight is given to an empirical testing of the various models and empirical testing strongly favours models other than the SL-CAPM.[17]

As Gray and Hall explain that: [18]

> *i. The AER rejects other models on the basis that the outputs are potentially sensitive to different estimation methods, when the same is true of the SL CAPM. In its recent final decisions, the AER's own range for the allowed return on equity from the Sharpe-Lintner CAPM is 4.6% to 8.6%.*
>
> *ii. The AER cites certain empirical studies to support its rejection of other models. However, the only reasonable interpretation is that the body of available evidence supports the empirical performance of other models over the Sharpe-Lintner CAPM. In some case, papers that the AER cites as supporting the Sharpe-Lintner CAPM actually do the opposite.*
>
> *iii. The AER rejects all estimates for other models on the basis that it finds some of them to be implausible.*

A significant part of the reasoning supporting the reselection of the SL-CAPM as a foundation model is explicitly conservative. Important factors in selecting this model included giving weight to the idea that other regulators adopt the SL-CAPM or the AER's perceptions as to whether the model is "well accepted"[19].

If an existing model is shown to be flawed in ways that newer models are not, collective inertia is not a proper decision making constraint upon giving the newer models real weight according to the substantive contributions they can make. It cannot be the case that by removing any reference within the rules to the incumbency of the SL-CAPM, the AEMC intended a "chicken and egg" situation that prevents the regulator from moving to adopt a new model until another regulator has.[20]

It has been known for well over 40 years that the SL-CAPM tends to underestimate the returns required on low-beta assets. Today it is known that, besides this important empirical problem, the SL-CAPM also has other

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[14] AER SA Power Networks Preliminary Determination Attachment 3 at [3-122].

[15] Compare SFG Consulting, The required return on equity for regulated gas and electricity network businesses 6 June 2014, pages 8, 20 to 24 with AER, Rate of Return Guideline Explanatory Statement, Appendix A, pages 10 to 12.

[16] Compare SFG Consulting, The required return on equity for regulated gas and electricity network businesses 6 June 2014, pages 8, 26 to 40 with AER Rate of Return Guideline Explanatory Statement, Appendix A, pages 17

[17] Compare SFG Consulting, The required return on equity for regulated gas and electricity network businesses 6 June 2014, pages 8, 25, 35 with AER Rate of Return Guideline Explanatory Statement, Appendix A, pages 8, 11 to 12

[18] Frontier; *Key issues in estimating the return on equity for the benchmark efficient entity*; June 2015; paragraph [17]; page 7.

[19] AER Rate of Return Guideline Explanatory Statement, 17 December 2013, Page 31.

[20] AER, Rate of Return Guideline Explanatory Statement, 17 December 2013, Appendix A, pages 12 - 13

empirical problems and alternative asset pricing models that do not suffer from these problems are widely available. [21] The SL-CAPM is a highly simplified model that takes a risk-free rate and adds the product of a "beta" with a general market risk premium.

On the "flip-side", when assessing the "pros and cons" of alternative models, the AER is overly critical, testing them against a much more stringent standard than is applied to the SL-CAPM.

Before examining this aspect of the Qld/SA Preliminary Determinations, it is useful to observe how the US regulators have assessed the various models because there is a considerably longer history in the US of considering the various options.

The allowed rate of return objective now used in Australia's National Electricity Rules and National Gas Rules effectively codifies long standing U.S. Federal case law: [22]

> *[T]he return to the equity owner should be commensurate with the returns on investments in other enterprises having corresponding risks.*

In doing so, the same U.S. case law also includes the requirement in the Australian revenue and pricing principles concerning the necessity for the business to have a reasonable opportunity to recover its efficient costs: [23]

> *That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital.*

The main difference is that there is no explicit requirement upon FERC to have regard to all the available inputs.

The above case was decided in 1944 and in the U.S. there is a history of applying the standards articulated above. At the federal level in the United States, the Federal Energy Regulatory Commission (**FERC**) describes its use of the DGM *grosso modo* as its "standard bearer" when undertaking economic regulatory work: [24]

> *For over 30 years, the Commission has based ROEs on the rate of return required by investors to invest in a company – otherwise known as the capital attraction rate of return, or the market cost of equity capital. Over this period,* ***the Commission has relied primarily on the DCF model to provide an estimate of the investors' required rate of return****.*
>
> **[Emphasis added]**

Even though there is no explicit requirement to consider a range of models, FERC does indeed consider the rates of return that other models produce and these estimates are employed in determining what final rate of return to apply in setting regulated returns.

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[21] SFG Consulting, 6 June 2014, page 25, 35 and SFG Consulting 22 May 2014, Cost of equity in the Black Capital Asset Pricing Model 10 and 11; NERA, 2015, Empirical Performance of the Sharpe-Lintner and Black CAPM.

[22] *Federal Power Commission v Hope Gas Co* 320 US 591 (1944) at 603.

[23] *Ibid*.

[24] See Federal Energy Regulatory Commission, Opinion No. 531 (2014) at paragraph 14. This case was the landmark case in which the Commission determined to harmonise the approach in electricity and gas in which it had previously used two different forms of the DCF. The approach was to apply the "two-stage" methodology previously used in gas to apply to both energy types. Still relevant, therefore, is FERC June 1999, Cost-of-Service Rates Manual for gas pipelines, page 16 of which clearly identifies the DCF as the dominant US model.

In the leading case, the use of three other models led the Commission to depart from the midpoint of the DCF analysis and instead adopt a figure three quarters of the way up its DCF range: [25]

> *The NETOs presented five alternative benchmark methodologies in this proceeding: risk premium analysis, the CAPM, comparison of electric ROEs with natural gas pipeline ROEs, comparison of electric utility DCF results with non-utility DCF results, and expected earnings analysis. Of those five, we find the risk premium analysis, the CAPM, and expected earnings analyses informative,* ***and each produces a midpoint (or median) ROE higher than the midpoint of our DCF analysis here****. In considering these other methodologies, we do not depart from our use of the DCF methodology; rather, we use the record evidence to inform the just and reasonable placement of the ROE within the zone of reasonableness established in the record by the DCF methodology.*
>
> *…*
>
> *The NETOs' risk premium analysis indicates that the NETOs cost of equity is between 10.7 percent and 10.8 percent,* ***which is higher than the 9.39 percent midpoint produced by our DCF analysis****. Similar to the risk premium analysis, the NETOs' CAPM uses interest rates as the input for the risk-free rate, which makes it useful in determining how the interest rate environment has impacted investors' required returns on equity. Further, CAPM is utilized by investors as a measure of the cost of equity relative to its risk. Using the same proxy companies from our DCF analysis, before screening for low-end outliers, the NETOs'* ***CAPM analysis produces an ROE range of 7.4 percent to 13.3 percent, with a midpoint value of 10.4 percent and a median value of 10.9 percent****. Finally, the NETOs' expected earnings analysis, given its close relationship to the comparable earnings standard that originated in Hope, and the fact that it is used by investors to estimate the ROE that a utility will earn in the future can be useful in validating our ROE recommendation. Once again using the same proxy group that we used in our DCF analysis,* ***the expected earnings analysis has an ROE range of 8.1 percent to 16.1 percent, with a midpoint value of 12.1 percent and a median value of 10.2 percent****. The record evidence from each of these models affirms our setting the ROE at* ***a point above the midpoint*** *[emphasis added] under these circumstances.*
>
> **[Emphasis added]**

At first glance it could be said that the US Federal regulator's approach it similar to that of the AER's foundation model in that it uses a primary model (albeit the DCF model) and other models play a secondary role of selecting a value within a range. However, FERC's use of the DCF model is not at all like the AER's foundation model approach. Most significantly each of the other models are employed to generate independent rate of return estimates in a manner that is consistent with their application by finance practitioners as stand-alone estimation models rather than using them in an idiosyncratic, indirect way to select parameters in a foundation model. FERC then actually gives the rate of return estimates themselves real weight in selecting the final value for the return on equity.

At the State level in the US there is a divergence of approach by the various public utilities commissions. Surveying the picture as a whole, Malko explains how these PUCs all use the DCF model and amongst their number it is common for many of them to also use a range of models. The most common models used in combination are the DCF, ECAPM (which delivers the same results as the Black CAPM) and, in some cases, the Fama-French model. Although the PUCs who use a range of models rarely take explicit simple or weighted averages of the results of the available models, they most often consider the results of each of the models on an equal footing without giving any one model primacy.

The above overview of the US regulatory approach provides a good starting point to explain our concern that the Qld/SA Preliminary Determinations take an overly harsh approach to the criticisms of all the models other than its favoured SL-CAPM.

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[25] Federal Energy Regulatory Commission, Opinion No. 531 at paragraph 147.

The first "family" of models to consider are the various capital asset pricing models.[26] Over the 40 years since the SL-CAPM was first widely used, a range of alternative capital asset pricing models have become widely accessible. The Black CAPM has a more flexible functional form and can more closely model observed returns and be used for predictions.[27] The Fama-French model has put forward additional variables that can have considerable explanatory power when seeking to explain or predict market rates of return.[28]

The other predominant family of models is the DGM or DCF family of models. This family has a long standing pedigree, particularly in the US, as providing an alternative means to establish a regulatory allowance for the return on equity. Over the last 40 years regulators have used "one-stage" and "two-stage" versions of these models and until 2014 both were in widespread use (for example, the "one-stage" version was in active use for interstate electricity transmission regulation and a "two-stage" version for interstate gas transmission). Now a "two-stage" version is used for all Federal decisions for both energy types and also it is the version most commonly implemented by the PUCs.

With respect to the **Black CAPM** the AER asserts[29] that:

- the zero-beta asset is unobservable and there is no reliable way to identify the market return for a zero-beta asset, and
- it is not used for regulatory purposes.

On pages 19 and 20 of the report titled "Beta and the Black Capital Asset Pricing Model" of February 2015, Gray and Hall explain how the first criticism is unreasonably harsh. The AER appears to have reached this conclusion simply because different methods of estimation produce different results but this could be said of almost every single aspect of the estimation process for the return on equity using any of the models. When implementing the SL-CAPM it is necessary to consider the merits of various options for the risk-free rate, beta and market risk premium and make a selection. There is no difference in concept or magnitude when considering the various candidates for the zero-beta rate for use in the Black CAPM.

The second criticism is addressed by Malko who states: [30]

> *I have been asked to comment on the correctness or otherwise of the statement in the Australian Energy Regulator's (AER) Final Decision, ActewAGL distribution determination 2015-16 to 2018 -19 - Attachment 3 - Rate of Return document:*
>
> > "There is little evidence that other regulators, academics or market practitioners use the Black CAPM to estimate the return on equity. In particular, regulators rarely have recourse to the Black CAPM" at page 3-256.
>
> *As I have explained above, although there is little explicit reference to the Black CAPM, in practice the use in the U.S. of the Empirical CAPM by financial analysts both within and outside energy regulatory processes is essentially to the same effect.*

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[26] NERA has provided an extensive literature review concerning this family of models. See NERA, Review of the Literature in Support of the Sharpe-Lintner CAPM, the Black CAPM and the Fama-French Three-Factor Model, A report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA PowerNetworks, and United Energy, March 2015.

[27] SFG Consulting, The required return on equity for regulated gas and electricity network businesses 6 June 2014, page 8: "*The Black CAPM provides a better fit to the empirical data than the Sharpe-Lintner CAPM…*"

[28] SFG Consulting, The required return on equity for regulated gas and electricity network businesses 6 June 2014, page 8: "*The Fama-French model has the advantage of providing an unambiguously better fit to the data than the Sharpe-Lintner CAPM*."

[29] The AER's view on this point dates from at least 2011 when the AER based its Envestra decision on advice to this effect by Kevin Davis.

[30] Malko; paragraphs [6.4] and [6.5]; page 8.

Marko explains how the regulators give effect to the Empirical CAPM as follows: [31]

> *The regulators who have been presented with ECAPM evidence have considered it along with evidence from the DGM or DCF and Sharpe CAPM. The results from all these approaches have been recorded in the decisions and the selection of a particular figure has been made following that consideration.*

Examples of the Empirical CAPM in active use in the US include:[32]

- New York Public Service Commission, 2009
- New York Public Service Commission, 2007
- New York Public Service Commission, 2006, and
- Oregon Public Utility Commission, 2001.

With respect to the **Fama-French Three Factor Model** the AER:

- claims that the three factor model is lacking in merit because it arose from empirical observation rather than "theory" when in fact all theories are developed as a way to explain observed phenomena. Regardless of which came first—theory or empirical testing—the order does not affect the relevance of the model[33]
- puts forward the perverse suggestion that because the model's authors continue to seek and find further refinements that may produce even better results the existing model and the insights it provides relative to the SL-CAPM should be discarded, and
- makes spurious distinction between a model's ability to explain past equity returns as opposed to explaining future equity returns.[34] Unless there is a reason why the world has changed there is no basis for doubting the prospective usefulness of a model that very well explains past returns.

Gray and Hall respond to all these criticisms in more detail in their 2015 report titled "Using the Fama-French model to estimate the required return on equity".

Despite being the newer model, since the turn of the century the Fama-French Three Factor model has been part of the evidence in a number of state regulatory proceedings in the United States, including:

1. Before the Massachusetts Department of Telecommunications,[35] Mr Hunt (an expert witness) cites the Fama-French study.
2. Before the California Public Utilities Commission,[36] Mr Hunt (an expert witness), used the Fama-French Three Factor model and calculated a cost of equity in September 2005.
3. Before the Delaware Public Service Commissioner,[37] Artesian Water Company led evidence that included Fama-French model results.[38]

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[31] *Ibid*; paragraph [5.5]; page 7.

[32] Further details can be found in the submissions to the AER on the regulatory proposal for our Victorian distribution business.

[33] AER Rate of Return Guideline Explanatory Statement, 17 December 2013, Appendix A, page 8

[34] AER Rate of Return Guideline Explanatory Statement, 17 December 2013, Appendix A, pages 19 to 20

[35] Moul, Paul R.; *'Direct Testimony of Paul R. Moul, Managing Consultant, P. Moul & Associates, Concerning Cost of Equity,' Commonwealth of Massachusetts Department of Telecommunications and Energy*; October 17 2005; page 50.

[36] *Applications by Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company* 2005 Cal. PUC LEXIS 537; 245 P.U.R.4th 442.

4. Mr Ronald Knecht (an expert witness for the Nevada Public Utilities Commission)[39] proposed a return on equity that was calculated as an arithmetic mean of four components. He applied two discounted cash flow (DCF) estimates, a 2CAPM/FF3F model average, and one risk premium estimate.

5. On a separate occasion, in July 2007, Mr Knecht acted on behalf of the Nevada Public Utilities Commission[40] and again used the Fama-French Three Factor Model to assess the rate of return on equity.[41]

6. On another occasion in December 2014, Mt Knecht gave expert evidence (which included results from the Fama-French model) before the California Public Utilities Commission.[42]

7. Mr Hayes an expert from San Diego Gas & Electric used the Fama-French model in his testimony before the California Public Utilities Commission in May 2007.[43]

The cases on point suggest that increasingly more companies are using the Fama-French model as a source of additional data.

The AER singles out the **Dividend Growth Model** or **Discounted Cash Flow** model as being excessively sensitive to the growth input assumption.[44]

In response, Grant Samuel states: [45]

> *It is also difficult to fathom why the AER states that the DGM is highly sensitive to interest rates but makes no mention of the sensitivity of CAPM to interest rates.*

And: [46]

> *In our opinion, in examining the CAPM and comparing it to the DGM, the AER has unfairly accentuated the failings of the DGM while, at the same time, it has ignored many real shortcomings in the CAPM.*

The AER also argues that there are insufficient data with which to estimate the cost of equity for a regulated energy utility. For example, the AER states that: [47]

> *data are now only available for five energy infrastructure businesses: APA Group; DUET; Envestra Limited; SP AusNet; and Spark Infrastructure Group. Given the strong assumptions required when implementing DGMs, we are sceptical about the robustness of deriving a benchmark estimate of the return on equity based on the data of five businesses.*

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[37] *In the matter of the application of Artesian Water Company, Inc: for an increase in water rates* 2003 Del PSG LEXIS 51.

[38] *Ibid*; at [8] .

[39] *Application of Sierra Pacific Power Company,* 2006 Nev. PUC LEXIS 91 at [63].

[40] *Application of Nevada Power Company* 2007 WL 2171450 (Nev. P.U.C.).

[41] *Application of Nevada Power Company* 2007 WL 2171450 (Nev. P.U .C.) at [1 02]; and *Application of Sierra Pacific Power Company,* 2006 Nev. PUC LEXIS 91 at [63].

[42] *Application of Southern California Edison Company 2014 Cal. PUC LEXIS 622 at [7], citing Application of Southern California Edison Company* 2007 Cal. PUC LEXIS 593 at [5.2.5].

[43] Testimony of Garry G Hayes on behalf of San Diego Gas and Electric before the California Public Utilities Commission 2007; page 19.

[44] AER Preliminary Determination Attachment 3 at [3-257].

[45] Letter from Grant Samuel & Associates Pty Limited (Grant Samuel Letter) to the Directors of Transgrid; 12 January 2015 page 2.

[46] *Ibid*; page 2.

[47] AER Rate of Return Guideline Explanatory Statement, 17 December 2013, Appendix E, page 119.

We note that the AER is content, on the other hand, to rely on a small sample of Australian energy infrastructure businesses in estimating the equity beta of a benchmark efficient entity. Thus the AER is not consistent in expressing its concerns over data availability.

As quoted above FERC uses the model as its *primary* model. The Malko report provides additional historical background and fills out the picture by surveying the approach of key State regulators: [48]

> *The Dividend Growth Model (DGM), also the DCF, is based upon the works of Irving Fisher and John Williams in the 1930s. The DGM or DCF was introduced for estimating the cost of common equity for regulated energy utilities by state regulatory authorities during the 1960s and early 1970s.*
>
> *....*
>
> *The adoption of the DGM or DCF constituted a significant advance in the science of what constitutes a fair market reflective rate of return. This model is still considered and almost universally used, alone or in a multi-model approach (as I discuss further below), by almost all energy regulators in the United States.*

With Australia in mind, Gray and Hall[49] have specifically addressed each of the AER's implementation concerns in relation to the DGM.

In conclusion, under the new National Electricity Rules and National Gas Rules that require all the relevant models to be considered, it is an untenable to assert that the SL-CAPM is the preferable, let alone the only model that is usable for economic regulatory purposes. To the contrary, the evidence suggests that each of the other models that we have proposed is *at least* as worthy as the SL-CAPM.

2.3 THE AER'S METHOD DELIVERS ACUTE UNDER-COMPENSATION IN CURRENT CONDITIONS

There are two aspects to this concern: First, there are features of the AER's foundation model, the SL-CAPM, that will systematically give downwardly biased results over the whole interest-rate cycle. Second, when interest rates are cyclically low – and the 10-year Commonwealth Government Security yield has recently touched record lows – the downward bias of the foundation model may be significantly accentuated.

The foundation model is structurally biased to give inadequate returns across the interest-rate cycle because:

- the level of risk has been under-estimated (this issue is discussed in section 1 of this submission)
- the SL-CAPM has a low-beta bias—this issue is very fully addressed in the submissions of the SA/Queensland businesses and there is no basis to conclude that a sufficient adjustment has been made by the AER; that being the 'rough and ready' selection of an SL-CAPM beta at the upper end of an overly constrained range inspired by the conceptual underpinnings of the Black CAPM, and
- it is quite apparent that there are significant problems with the way the AER selects its market risk premium which we explain further in this discussion.

With respect to the market risk premium, the fact that the MRP estimates the AER has considered vary so widely and do not over-lap with each other should sound an alarm. The starting point and the input given the most weight are a whole series of divergent historic averages. It is quite remarkable that these figures diverge

[48] Malko; paragraphs [3.1] to [3.2]; page 4.

[49] SFG Consulting, 2015, Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network.

so significantly given that they are all averages drawn from the same data series—using two different averaging techniques and overlapping time-based 'panels' of data from the overall series.

The principle problems here are that:

- **Use of geometric averages.** The AER has failed to recognise that only arithmetic averages are appropriate to use because the AER does not compound estimates of the cost of equity or the WACC. Geometric averages would only be relevant if the AER were to compound, and
- **Use of Brailsford adjustment.** The AER continues to adhere to the so-called "Brailsford adjustment" of the historical data on the basis of a misconception that it is an adjustment that was carefully considered and endorsed by the Australian Securities Exchange. In fact, the ASX did not have the benefit of the subsequent work by NERA, the ASX has stated explicitly that it holds no opinion on what adjustment, if any, should be made to the data and the Brailsford authors have never provided an adequate response to the additional discoveries that NERA has made. [50] NERA has recently provided a further report that examines the sensitivity of the adjustments to the historical data, which it provides, to changes in the method that it uses and finds the adjustments are not sensitive.[51]

The above issues are explained in a submission by United Energy to the NSW/ACT distribution determinations dated 26 March 2015 which also explains why these issues are important within the overall AER approach to building up an estimate for the market risk premium. The three exhibits to that submission provide copies of the source material that unequivocally establishes that attributing any form of endorsement by the Australian Securities Exchange to the Brailsford adjustment is incorrect and this is significant because it is the primary basis stated for the AER's preference for the Brailsford work over that of NERA.

Turning to the particular problems that arise with the foundation model implemented at a time of record low interest rates, these arise because the foundation model relies on implementing the SL-CAPM by combining a current measure of the risk-free rate with a market risk premium derived from more than 100 years of data. In times of unprecedented low interest rates, this approach is likely to deliver values that are materially lower than prevailing market required returns.

As the Governor of the Reserve Bank of Australia, Mr Glenn Stevens has explained, in reality the return that the market requires on equity does not appear to have followed the unprecedented downward movement in base rates: [52]

> *[A key] feature that catches one's eye is that, post-crisis, the earnings yield on listed companies seems to have* ***remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero****.*
>
> **[Emphasis added]**

This is a point that Gray and Hall have made in the various reports lodged by the businesses for quite some time.[53]

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[50] ASX, Re: Historical price indices, and dividend yield data from the ASX, 18 March 2015.

[51] NERA; Further Assessment of the Historical MRP: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors, A report for United Energy, June 2015.

[52] Reserve Bank of Australia; the World Economy and Australia Address to the American Australian Association luncheon hosted by Goldman Sachs, New York, USA (**RBA Speech**); 21 April 2015.

[53] See for example, the CEG report referred to in SAPN's submission and SFG Consulting, "The required return on equity for regulated gas and electricity network businesses" 6 June 2014, page 51 to 53.

This means that adding a long-run average market risk premium to the currently observed risk-free rate will likely deliver downwardly biased results when risk-free rates are low and upwardly biased results when risk-free rates are high. In the current environment of record low risk-free rates, the simple addition of a very long-term market risk premium and a currently observed risk-free rate is almost bound to significantly undercompensate equity investors.

Again, it is informative to consider the views of the Federal Energy Regulatory Commission whose decisions corroborate the submissions you have received from the SA and Queensland businesses.

Unlike the capital asset pricing models, the DGM that FERC uses is not structured as a build-up of margins over a base interest rate. Nevertheless, the duration of the regulatory process has traditionally required there to be a post-hearing adjustment to the rate of return that is initially set and, in the past, FERC has done this by making a 1:1 adjustment for changes in US Treasury bond yields over the same period.

In the current unprecedented interest-rate environment, FERC has had to reconsider this approach and its conclusions are a powerful corroboration of our concerns with the AER's implementation of the SL-CAPM: [54]

> *[W]hile U.S. Treasury bond yields are an important indicator of capital market conditions and therefore inform our determination of an appropriate base ROE, the capital market conditions since the 2008 market collapse and the record in this proceeding have shown that* ***there is not a direct correlation between changes in U.S. Treasury bond yields and changes in ROE****.*
>
> *…*
>
> *In Southern California Edison Company, a 2008 case in which the post-hearing adjustment was at issue, expert testimony indicated that,* ***as U.S. Treasury bond yields decreased DCF results instead went up, indicating an inverse relationship between U.S. Treasury bond yields and utility ROE*** *[emphasis added]. The record in this proceeding also shows an inverse relationship, but with rates moving in opposite directions:* ***U.S. Treasury bond yields have increased while DCF results for the NETOs have gone down****.*
>
> *The record in this proceeding also casts doubt on the magnitude, not just the direction, of the relationship between U.S. Treasury bond yields and utility ROE. The Commission's practice traditionally has been to adjust the ROE using a 1:1 correspondence between the ROE and the change in U.S. Treasury bond yields—i.e., for every basis point change in the U.S. Treasury bond yield the Commission would adjust the ROE by one basis point. However,* ***the record in this proceeding indicates that the 1:1 correspondence may not be accurate under current financial conditions, and that a significantly different ratio might be more appropriate—i.e., for every basis point the U.S. Treasury bond yields change, the Commission should adjust the ROE by a fraction of that amount****.* ***Thus, the record evidence indicates that, currently, adjusting ROEs based on changes in U.S. Treasury bond yields may not produce a rational result, as both the magnitude and direction of the correlation may be inaccurate****.*
>
> *Upon consideration of the record evidence in this proceeding, and in light of the economic conditions since the 2008 market collapse more generally,* ***U.S. Treasury bond yields do not provide a reliable and consistent metric for tracking changes in ROE*** *after the close of the record in a case.*
>
> **[Emphasis added]**

It might be tempting to jump to the conclusion that under-compensating investors at this time is of little concern if, once the economic cycle turns, the current under-compensation could be off-set by future over-compensation

[54] Federal Energy Regulatory Commission, Opinion No. 531 at paragraphs 158 to 160.

but this is not the case. If there is a mismatch in either direction between prevailing rates and regulatory allowances, inefficiencies will arise:

- Firstly, there are costs for the businesses of absorbing inter-temporal fluctuations in returns through explicitly or implicitly carrying a balance sheet provision for such a mismatch.
- Secondly, at times of under-compensation, timely investments are discouraged or delayed and at times of over-compensation the opposite effect applies and there is an incentive to invest earlier than required.

Neither is efficient. Note also that these effects are pro-cyclical which means that the direction of the mismatch encourages businesses to reduce capital expenditures at times that input costs are likely to be low and to increase capital expenditures at times when input costs are likely to be high.

It is appropriate, therefore, that the rules require (as they do) that each determination provides for a regulatory allowance that is commensurate with the prevailing efficient costs for a benchmark firm at the time. In the AEMC's words: [55]

> *If the allowed rate of return is not determined with regard to the prevailing market conditions, it will either be above or below the return that is required by capital market investors at the time of the determination. The Commission was of the view that neither of these outcomes is efficient nor in the long term interest of energy consumers.*

In the current economic environment, this requires a significant change in the way in which it traditionally combines 'on the day' base rates with an extremely long-run average market risk premium. Using an approach in which the regulatory return on equity moves in a 1:1 relationship with base interest rates is contrary to the observed movements in the prevailing cost of equity. On the other hand, we would not assert that the ratio is 0:1.

For this reason:

- in implementing the SL-CAPM, we follow Gray and Hall's advice that the Ibbotson and Wright approaches to implementing the SL-CAPM are opposite ends of a spectrum and the moderate and reasonable approach is to take the mid-point of the estimates those two approaches produce, and
- we consider it all the more important to blend the results of the capital asset pricing models with the DGM.

[55] AEMC Rule Determination, 29 November 2012, page 44

3. IMPLEMENTING THE DEBT TRAILING AVERAGE METHOD

3.1 SUMMARY

We support the adoption of a regulatory framework that reflects the efficient costs of a benchmark entity. We agree with the AER[56] that both under the old rules and the new rules efficient debt raising practices had to effectively manage refinancing risks and, therefore, efficient debt portfolios necessarily involve staggered maturities and that annual updating better reflects efficient practices.

However, there are a number of ways in which we consider the approach to establishing the allowed rate of return for debt does not reflect the efficient costs of a benchmark firm.

3.2 CREDIT RATING

The first consideration concerns the credit rating.

In our view, the benchmark credit rating should be a BBB credit rating based on the median credit rating of the businesses who do not benefit from the implicit support of significant Australian or foreign government equity. We are also concerned that the AER's approach to setting the benchmark credit rating is based on a very small set of comparator firms and that this means that the benchmark is very sensitive to individual short-run changes in individual firms' credit ratings and it would be unacceptable for such short-term changes in one company's credit rating to make a significant and unpredictable change to the regulatory returns set by the AER.

To overcome this problem, it is appropriate to:

- **Step one.** Take the median credit rating over a reasonable period so that short-term ratings decisions do not have disproportionate weight. A five-year period would achieve the necessary stability while still providing a measure of the 'prevailing' cost of equity funds.

Step two. Consider how the credit ratings agencies' methodologies would apply to a hypothetical benchmark entity as CEG did in the report submitted by ActewAGL in its regulatory proposal.

3.3 OTHER EFFICIENT DEBT FINANCING COSTS

The second consideration is that not all the efficient costs have been included in the AER's proposed allowance.

The AER draws its benchmarks from independent service providers who report on secondary market trades. However, businesses do not sell their debt in piecemeal quantities on secondary markets. Rather, electricity network businesses must issue bonds in substantial tranches in the primary market and CEG has established that a new issue premium of approximately 30 basis points is borne by electricity network businesses. [57]

We are disappointed that the AER has rejected CEG's work on this issue based on a long list of potential criticisms. Concrete reasons are not provided as to why the criticisms presented are *likely* to apply in relation to CEG's work. On the other hand, many of the criticisms cannot be wholly dispelled without a great deal of work.

[56] AER Rate of Return Guideline Explanatory Statement, 17 December 2013, Page 107

[57] CEG, The New Issue Premium, October 2014.

In this regard, we consider that the AER is applying the wrong analytical test. Instead of seeking to establish an unbiased estimate of the businesses' costs, it has taken the approach that the businesses must justify a claim to a very high probative level.

If the AER were to properly apply the relevant test—that is, to arrive at an unbiased estimate, it would have two choices:

- adopt the advice in the only substantial body of work on the relevant topic—the work of CEG and the other studies that CEG review—pending the production of any further work, or
- undertake or procure an analysis of whether the potential criticisms of CEG's approach in fact apply.

In addition, to the extent that our operational expenditure or capital expenditure allowances do not make provision for the direct costs of raising debt (i.e. underwriter fees, legal fees and the like) these also need to be included in the WACC calculation.

3.4 MARKET DATA FOR DEBT

The third consideration concerns the source of the market data for debt.

In the draft determinations the AER proposes to source the figures as a simple average of the figures available from Bloomberg and from the RBA (each extrapolated out to the 10-year benchmark tenor). In reaching this decision, the AER sought to follow the approach that the Australian Competition Tribunal requires but in our view this was not done properly.

The Australian Competition Tribunal requires that the AER consider for each of the available services: [58]

- its approach to bond selection and curve specification
- the past performance of the service
- whether the figures published by the service reflect prevailing market conditions at the time the assessment is made.

In all the Jemena Gas Networks draft determination, the AER undertook the first two of these assessments but shunned the third, characterising it as an "indirect" and inferior means of assessing which is a better service compared with the first which it described as a "direct" and superior basis for assessing which of the services better merits selection.[59]

We do not agree that the draft decision adequately test the merits of the two services because there is no assessment of which of the services better reflects prevailing market conditions. Further, to characterise a comparison of the figures published to prevailing market conditions as an "indirect" assessment indicates that the AER has misdirected itself. The rate of return objective requires that the allowance for debt is commensurate with the prevailing costs of a benchmark firm and a comparison of the figures produced by the independent service provider and the underlying market is the most direct way to bring about an allowance that is commensurate.

[58] ActewAGL Distribution [2010] ACompT 5; (2010) ATPR 42-324, paragraph 77

[59] AER, Draft decision, Jemena Gas Networks (NSW) Ltd, Access arrangement 2015–20, Attachment 3; November 2014, Page 3-144.

Since the AER has determined that there should be annual updating of the benchmark debt data itself, it stands to reason that there also needs to be an updated selection of which service to use. There is no legal impediment to doing this because it can be an automated and a formulaic process has been proposed by Jemena Gas Networks.

In the Qld/SA Preliminary Determinations the AER explains that it has tested the Bloomberg 7 year curve against the RBA's 10-year curve and found neither to be unequivocally superior and it is on this basis the AER adopts the 50:50 average between the two.

However, the SA Power Networks Preliminary Determination also states that should Bloomberg continue to publish a 10-year yield, it will be used in the 50:50 average in the place of an estimate based on extrapolation. We are concerned that this will be done without having tested the Bloomberg 10-year yield, which appears, upon examination, to provide an inferior estimate of the 10-year yield than one based on extrapolation of the RBA curve. We note that SA Power Networks has submitted a report by CEG that suggests Bloomberg is producing the 10-year yield using an extrapolation method that simply employs the shape of the CGS yield curve. CEG demonstrates that there is evidence in May 2015 that the Bloomberg 10-year BBB yield underestimated the yield on a 10-year BBB bond issued by Asciano.

4. AN APPROPRIATE TRANSITION PATH FOR DEBT

4.1 SUMMARY

Rule 6.5.2(j) provides that the allowance for debt may be determined using the "on the day" method, on the basis of an average of the costs of debt raised over an historical period prior to the determination or a combination of the two. Rule 6.5.2(k) provides that the allowance would take account of any impacts on the benchmark efficient firm arising from a change in methodology.

This means that adopting a new return on debt benchmark may require a transition—and this may depend on both what was efficient under the old rules and that under the new rules if a new benchmark is adopted.

4.2 THE OLD RULES

Under the previous regulatory arrangements, an efficient benchmark business needed to manage as best it could:

- refinancing risk—the risk that it may not be possible or economic to refinance a business's entire debt portfolio at one time or a substantial part of it, and
- the risk of disparities in interest rates between the averaging period used for the "on the day" methodology and the interest rates prevailing at the time debt was actually raised.

In 2009, as part of consultation on the AER's WACC parameter reset determination, the corporate treasurers of Envestra (paragraphs 5.16, 5.17, 6.4 and 6.5),[60] Jemena (see paragraph 5.19, 5.23 and 5.25),[61] SP AusNet (paragraphs 4.9 to 4.15 and 5.1 to 5.9)[62] and Citipower and Powercor (paragraphs 5.2, 5.4, 7.1 and 7.2)[63] each provided the AER with statements explaining how under the previous rules no business would prudently raise all its debt in the "on-the-day" averaging period. Rather all businesses sought to stager their maturities to avoid refinancing risk and then generally undertook hedging transactions to control their exposures to interest-rate movements as well as they reasonably could.

Although there is an actively traded market for base rate swaps, there is no equivalent for generic BBB debt and therefore it is not possible to directly hedge movements in the debt risk premium. Indeed an ability to better manage volatility in the debt risk premium is one of the principal advantages of ultimately moving to the trailing average method. This has been acknowledged by the AER: [64]

> *For an Australian efficient operator there is no market to effectively, and in a cost efficient manner, hedge their DRP.*

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[60] Statement of Gregory Meredith (Envestra), an appendix to the Joint Industry Associations' submission to the AER on the WACC parameters review of February 2009

[61] Statement of Sim Buck Khim (Jemena), an appendix to the Joint Industry Associations' submission to the AER on the WACC parameters review of February 2009

[62] Statement of Alastair Watson (SP AusNet), an appendix to the Joint Industry Associations' submission to the AER on the WACC parameters review of February 2009

[63] Statement of Andrew Noble (Citipower and Powercor), an appendix to the Joint Industry Associations' submission to the AER on the WACC parameters review of February 2009

[64] AER, Better Regulation, Explanatory Statement, Rate of Return guideline, page 122.

The AER suggests that an efficient benchmark firm would have managed its debt portfolio under the "on the day" approach in the following way: [65]

> *Given the observed practices of regulated network businesses and the definition of the benchmark efficient entity, we consider that the following practice is likely to constitute* ***an efficient debt financing practice of the benchmark efficient entity*** *under the current 'on the day' approach:*
>
> - *holding a debt portfolio with staggered maturity dates and using swap transactions to hedge interest rate exposure for the duration of a regulatory control period…*
>
> **[Emphasis added]**

Whether a benchmark efficient entity could have used an alternative strategy to also eliminate at least some of the risk associated with shifts in the debt risk premium is an empirical matter.

Under the previous rules, the "on-the-day" methodology was mandatory and the flexibility concerning whether and how the AER might recompense the businesses for their efficient costs was constrained.

4.3 THE NEW RULES

Under the new rules, however, the AER has greater flexibility in setting the returns on debt. However:

- it is mandatory under rule 6.5.2(a) and (b) to determine the debt allowance consistent with the rate of return objective which requires that the rate of return be commensurate with the efficient financing costs of the benchmark efficient entity, and
- where there is discretion to be exercised, that it be done in accordance with the revenue and pricing principles of the NEL including providing network businesses with a reasonable opportunity to recover their efficient costs.

Having made what the AER believes to be the factual finding that it is efficient under the previous rules for a business to raise debt on a staggered basis and hedge to the averaging period, it would be an error for the AER not to establish the rate of return on a basis that enables the businesses to recover the efficient costs of doing so.

The transition path in the guidelines is not established on that basis and it is at significant risk of failing to comply with the rule 6.5.2(a) and the section 7A of the NEL unless it can be demonstrated that the transition path in the guideline provides *at least* as high a return as a transition path that is explicitly calculated on the basis of the costs of a business with a portfolio of debt with staggered maturities and hedging.

It would be considerably safer for the AER to make a determination that directly employs its finding concerning the efficient debt portfolio of a benchmark efficient business.

This means that the benchmark efficient firm would transition into the first determination under the new rules with:

- a trailing average DRP, and
- a floating rate exposure for its underlying or risk-free component of its cost of debt (which it can hedge).

[65] AER, Better Regulation, Explanatory Statement, Rate of Return guideline, page 107.

4.4 CORRECT TRANSITION

Therefore in making its regulatory determinations, the AER should adopt a position that is consistent with the analysis it has undertaken and the expert advice it has received on this issue and a 'hybrid' transitional arrangement would be more appropriate. That is, there should be:

- **Base rate transition.** A 10-year transition to a trailing average estimation of the base rate (e.g. risk-free rate) component of the return on debt.
- **No DRP transition.** No transition for the debt margin (or debt risk premium) component. That is, the AER should immediately move to a trailing average estimation of the debt risk premium component. This means that for the first year of the forthcoming regulatory period, the debt risk premium would be estimated as a 10-year trailing average, and this trailing average estimate would be updated in each subsequent year.

This approach would provide for an estimate of the return on debt which better reflects the required return on debt for the benchmark efficient entity. As noted above, under the efficient financing strategy identified by the AER in the NSW Draft Decisions, the base interest rate component of the benchmark efficient entity's actual return on debt would have been matched with the regulatory allowance set using an "on-the-day" rate, but the debt risk premium component each year would have reflected the historical (or trailing) average of the debt risk premiums over the previous 10 years.

A further issue that is explained by CEG is that the optimal hedging strategy under the 'on the day' regulatory approach would have been for the business to hedge less than 100% of its volume of debt because there is a degree of natural hedging inherent in the partly off-setting movements in the base rates compared with the rate at which corporate debt is issued.

However, Lally has suggested that employing the "NPV=0" principle means that the AER should not adopt the hybrid transition because it would result in an alleged windfall gain. We support the explanation provided by the SA and Queensland businesses that Lally's views are factually incorrect (because there is no windfall gain) and that seeking to claw back a windfall gain in the way proposed is inconsistent with the policy behind incentive-based CPI-X regulation and the express provisions in the rules that implement this regulatory framework.

Accordingly, we submit that the AER should not adopt the transition set out in the Qld/SA Preliminary Determinations and instead the AER should adopt the hybrid transitional arrangement described above.

5. GAMMA

5.1 SUMMARY

Notwithstanding the detailed material set out in the Qld/SA Preliminary Determinations, we consider that a correct and internally consistent regulatory determination requires that gamma be established based on a *market valuation* as are all the other WACC parameters.

Although gamma is an input into the corporate income tax calculation, the value adopted for gamma ultimately has a role in determining returns for equity-holders. If the value ascribed to imputation credits is higher than the value that equity-holders place on them, the overall return to equity-holders will be less than what is required to promote efficient investment in, and efficient operation and use of, energy network services for the long-term interests of consumers.

A secondary reason why gamma needs to be established as a market value concerns internal consistency. If a market valuation for gamma is not adopted, the market valuations of other WACC parameters would not make sense because the valuations rely on market valuations for gamma.

The Qld/SA Preliminary Determinations reject the notion that a market valuation for gamma is required. Instead redemption rates are employed to calculate a pecuniary value that would best be characterised as tracing cash as it flows from one party to the next.

A new report by Gray and Hall has documented[66] the various ways in which the AER has sought to bridge the gap between its cash-tracing methodology (which has undergone a series of different name changes in the various AER documents) and the definition in the rules that gamma is the "value" of imputation credits.

Gamma is the product of two quantities:

- a measure of the proportion of the available imputation benefits that are distributed to shareholders (the **distribution rate**), and
- a pecuniary measure of what is being distributed.

5.2 DISTRIBUTION RATE

It is clear that the first of these quantities—the distribution rate—would ideally be a firm specific measure. Imputation credits can only be distributed to shareholders attached to a dividend and the choice of what proportion of earnings should be distributed is one element of a series of decisions that a business makes concerning its capital needs. The capital needs of firms will vary across firms and hence the distribution rate will also vary across firms. Up until this point, there does not appear to be any major controversy between the AER and the businesses.

The AER objects to taking a firm specific measure for the distribution rate—or a measure from a small sample—on the basis that it might create incentives to manipulate the dividend distribution decisions of the businesses concerned. Consequently, the AER adopts a distribution rate drawn from a panel of companies. While we do not agree that that the incentive effects are likely, our much more substantial objection is that the panel of firms that the AER has used comprises the largest listed ASX companies and these companies are quite unlike the conceptual benchmark efficient firm. The most significant issue is that the largest ASX companies typically

[66] Frontier Economics, An appropriate regulatory estimate for gamma; June 2015

have a diverse range of domestic and foreign income sources and they are thereby able to achieve a high distribution rate by distributing all (or most) of their domestic income while simultaneously choosing whether or not to retain a significant quantum of unfranked dividends as a source of investment capital.

The benchmark efficient business, however, is a domestic firm that does not have a choice to both distribute a high proportion of its available imputation credits and simultaneously use retained earnings as a source of capital.

Once distributed by each company according to its own decisions concerning its need for capital, imputation credits can effectively be traded between different parties because it is possible to buy and sell stocks on a 'cum' and 'ex' dividend basis. There is, therefore, the potential for significant arbitrage between imputation credits coming from different firms and there is, therefore, a single market value for these credits.

5.3 VALUE OF DISTRIBUTED CREDIT

One way of establishing the value of an imputation credit is from the transactions of willing but not anxious buyers. This is what Gray and Hall[67] do with dividend drop-off studies according to a methodology. Dividend drop-off studies provide an upper limit on the market valuation for imputation credits as explained by Gray and Hall and Wheatley and as such they provide the highest value that the AER should ascribe to theta. Methodologically, Gray and Hall's approach has been thoroughly scrutinised by a broad range of experts and by the Australian Competition Tribunal. In the Qld/SA Preliminary Determinations, the AER has levelled a new round of criticisms at the work of Gray and Hall. Gray and Hall's report responds to those criticisms in full but, *even if* Gray and Hall had not addressed the criticisms, the AER has not undertaken or procured any equivalent alternative contemporaneous market based valuation and, as such, there is no choice but to adopt that valuation.

Based on Gray and Hall's work, we consider that 0.35 is the most appropriate market valuation of gamma and combining this with the 70% distribution rate gives a figure of 0.25.

In the latest issue of *Accounting and Finance* Siau, Sault and Warren have considered the work of Gray and Hall and of Wheatley. They provide further evidence that imputation credits may not be capitalised into stock prices. While their work raises a series of new questions and possibilities, it is notable that each of these possibilities would imply that a lower value of gamma might be appropriate: [68]

> *For cost of capital estimation, arguably it is the returns expected by long-term investors that are of most consequence in setting the hurdle rate for companies to achieve. If imputation credits are not priced and hence do not influence expected buy-and-hold returns, then it may be more appropriate for them to be excluded when estimating the cost of capital. This would imply setting so-called θ = 0 under the commonly used imputation adjusted CAPM.*

This peer reviewed journal article is further corroboration of the material that we have previously submitted to the AER that 0.25 is as high as the AER can responsibly set the gamma.

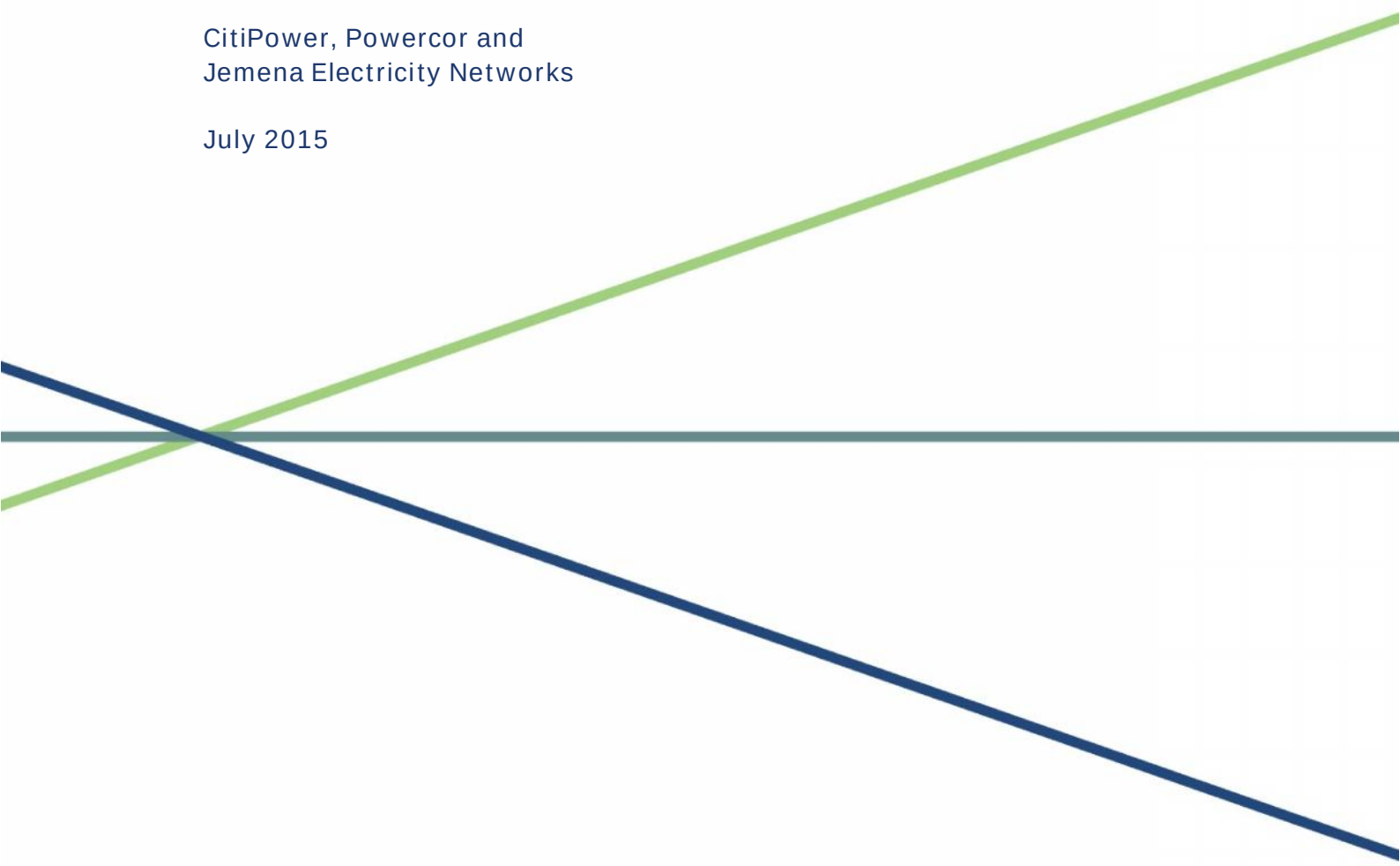
[67] SFG Consulting, An appropriate regulatory estimate of gamma, May 2014; Frontier Economics; An appropriate regulatory estimate for gamma; June 2015

[68] 55 (2015) 241-277 at page 244

Calculation of straight line depreciation – review of the AER's approximate calculation

CitiPower, Powercor and
Jemena Electricity Networks

July 2015



INCENTA
ECONOMIC CONSULTING

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1. Introduction and summary

1.1 Introduction

1.1.1 Scope of the report

1. I have been engaged by CitiPower, Powercor and Jemena Electricity Networks to review certain calculations the AER has performed in its preliminary decision for SA Power Networks[1] when calculating regulatory depreciation (the AER disagreed with the calculations performed by SA Power Networks and performed its own alternative calculation of regulatory depreciation). The specific matter that I have been asked to investigate is the calculation the AER has made in relation to the remaining life of each of the groups of assets that were in existence at the commencement of the new regulatory period, and whether there is a more suitable method for calculating depreciation under the National Electricity Rules.

2. In undertaking this task, I have been asked to assume the following:

   a. that the regulatory depreciation will be calculated using the "straight line" method, with the regulatory asset base escalated for inflation (measured using the Consumer Price Index, CPI), and

   b. the standard and remaining lives as determined by the AER for the 2010-15 regulatory period.

1.1.2 Authorship

3. This report has been prepared by Jeffrey John Balchin. I am the Managing Director of Incenta Economic Consulting, a firm that specialises in advising in relation to economic regulation issues in the infrastructure sector. I have 20 years of experience in relation to economic regulation and pricing issues across the electricity, gas, ports, airports and water sectors in Australia and New Zealand, having advised governments, regulators and major corporations on issues including the development of regulatory frameworks, regulatory price reviews and with respect to the negotiation of charges for unregulated infrastructure services. My full curriculum vitae is attached to this report as Appendix A.

4. I have read, understood and complied with the Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia, which are appended to this report as Appendix B.

[1] AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April.

1.2 Summary of key conclusions

1.2.1 Background – reason there is an issue

5. The AER uses the Post Tax Revenue Model (PTRM) to derive allowed revenues and ultimately price controls.[2] This model applies a simplified method to calculate regulatory depreciation for assets in existence at the commencement of the new regulatory period. The model requires all past expenditures to be grouped into a small number of classes (or groups), and with the straight line method of depreciation then applied to these groups. The formula for calculating the regulatory depreciation allowance in respect of a particular group of assets for the first year of the regulatory period is as follows:[3]

$$Depreciation = \frac{Starting\ asset\ value\ (group)}{Starting\ remaining\ life\ (group)}$$

6. The calculation is then repeated over the years, but with the asset value being reduced each year to remove depreciation in the previous year, and with the remaining life reduced by "1" each year.

7. The difficult – and contentious – issue is how the remaining life of the group of assets is calculated, and the veracity of simply reducing this value by "1" each year.

1.2.2 AER method for deriving the remaining life of the groups

8. The AER has calculated the "remaining life" for the group of assets as at the start of the new regulatory period by taking the weighted average of the relevant remaining lives. The weights employed in this calculation were the written down asset values of the relevant assets. The groups of assets for the next regulatory period will comprise a grouping of:

   a. The groups of assets that were established at the commencement at the previous regulatory period, and

   b. The individual assets that have been created since that time.[4]

9. The remaining lives used for these assets were as follows:

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2 The relevant model for distribution is contained in: AER (2015), Final decision: Amendment – electricity transmission and distribution network service providers post-tax revenue models (version 3), January, Appendix B.

3 The formula here assumes that both the asset value and depreciation amount are specified in constant price (i.e., real or inflation-adjusted) terms. The PTRM in fact converts asset values into constant price terms and applies the calculation described here, and so this aspect of the issue is uncontentious.

4 To be precise, the information collected by the AER comprises the annual expenditure on assets within each of a number of different classes (with all assets in each class having the same economic life), and so is already grouped to this level. However, as explained further below, given the AER's simplifying assumption that all capital expenditure occurs at the same point in each year, grouping to this level does not create any error.

a. *The groups of assets that were established at the commencement at the previous regulatory period* – the remaining life established last time, less 5 years, and

b. *Capital expenditure since that time* – the remaining life of the individual assets given their initial economic lives and year of construction.

1.2.3 Assessment of the AER method

Objective

10. I take it as accepted that the most accurate application of the straight line depreciation method is one where individual assets were depreciated over their own depreciable lives, and note that the AER has made comments to this effect.[5] I also understand that this is consistent with the application of the method in financial accounting, and is the method that would be expected to be desirable when used to set cost-based charges (being expected to smooth prices).

11. I therefore compare the AER's approximate calculation of straight line depreciation to the result that would be derived if the straight line method was applied to assets individually.

Assessment

12. I have assessed whether the AER's method for deriving the remaining life for a group of assets is mathematically correct, against the objective defined above. I find that the AER's method contains a mathematical error. The correct approach to deriving the remaining life of a group of assets for a base year is to:

a. first calculate the weighted average depreciation rate for the individual assets (using asset values as the weighting variable), and then set the remaining life equal to the reciprocal of this, or alternatively

b. set the remaining life for the group equal to the weighted average of the remaining lives of the individual assets, but using the depreciation associated with each asset in the base year as the weighting variable.

13. Thus, the error in the AER's method can be expressed as:[6]

a. deriving the remaining life of the group directly (i.e., as the asset-value weighted average of each asset's remaining life) rather than indirectly by first calculating the weighted average depreciation rate, or

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5 AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April, Attachment 5, pp.5-12, 5-13.

6 I find, however, that it is appropriate to simply reduce the remaining life of the group of assets by "1" each year as the AER proposes, although this is subject to the caveat discussed in the text that an error will exist after the time that individual assets would have been fully depreciated if the straight line method had been applied to assets individually.

b. using the incorrect weighting variable (i.e., using the asset value as the weighting variable, rather than the depreciation amount in the base year).

14. I find that the AER's method (subject to the caveat below) will overstate the remaining life for the group of assets, and so produce a depreciation allowance that is lower than the amount that would be derived by applying the method to assets individually. It is evident from the AER's preliminary decision in relation to SA Power Networks that the error in the AER's method can be very material.[7]

15. However, the depreciation allowance calculated using the method described in paragraph 13 will remain correct only while all of the assets within the group would have had a positive remaining value if the straight line method was applied to assets individually. Thus, an error will be created after the time that individual assets would have been fully depreciated, and from that time the depreciation allowance calculated would exceed the amount that would be derived from applying the method to assets individually.[8]

16. Correcting for this error in the context of grouping assets in the manner described above is not straightforward. The adjustment required to the formula that I have derived requires substantial information to be collected about the pattern of past expenditures and even then is complex, and the inherent flaw in the AER method means that it is not a suitable base from which to commence. Given the potential for a material error to be created, a preferred route in my view would be to alter how the depreciation allowance in respect of past capital expenditure is reflected in the PTRM so that additional information is factored into the calculation. I discuss possible options next.

1.2.4 Alternatives to using an approximate calculation

17. In the text, I discuss three possible options for increasing the amount of information that is factored into the calculation of the depreciation allowance, which are to:

a. Continue to group assets within an asset class, but construct a separate set of groups for the capital expenditure undertaken within each regulatory period

i. The effect of this would be to reduce and possibly nullify the error caused as a consequence of grouping assets[9]

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7 The method that SA Power Networks applied is very similar to what I derive as the correct approach in this report. The AER's preliminary decision led to materially different asset lives for some asset classes, and amounted to a difference in the revenue requirement of $320 million for the forthcoming regulatory period (AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April, Attachment 5, Table 5.3 and p.5-14).

8 I observe in the text that this outcome is consistent with the result the AER produced in Figure 5.1 of the Preliminary Decision (AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April, Attachment 5, p.5-16). As suggested in the text, the same effect also causes the error from applying the AER's method to reduce (as the new error offsets the original error) and eventually reverse, which is also consistent with the figure to which reference was just referred made.

9 If the standard lives of assets were rounded to the nearest five years and regulatory periods continued to be of a five year term, then the error in the depreciation allowance would be concentrated within a

b. Continue to group annual expenditure within an asset class,[10] but depreciate each of these values individually

   i. The effect of this is that the method of calculating depreciation for forecast capital expenditure would simply be extended into the future (after replacing forecast values with actual values)

c. Relay upon the businesses' business systems to keep track of the depreciation associated with assets that have already been created

   i. The effect of this is that the PTRM would take the (future) depreciation associated with past capital expenditures as an input. The calculation of depreciation in relation to forecast capital expenditure could be retained within the PTRM to ensure that flexibility in relation to price determinations is not lost.

18. Any of these options would be an improvement to the current method of deriving regulatory depreciation, and all would be straightforward to implement. My preference would be the second option as it would retain the PTRM as a self-contained model, not involve any compromise to the calculation of depreciation and not require any additional information to that already reported to the AER. I observe that even if a firm wanted to define 50 different asset classes, then this would still be straightforward to implement as a single worksheet in an Excel spreadsheet.[11]

single regulatory period (i.e., depreciation would be too high at the start of the period and too low at the end). The smoothing of revenues would imply that no effect on tariffs would be created.

[10] The AER's standard approach commences the depreciation of assets from the year after the expenditure has occurred. Thus, there is no loss of information from grouping all expenditure of a particular asset class that is undertaken within a particular year.

[11] The standard approach for applying the straight line depreciation method is to set out the calculation in a matrix format for each asset class, with the capital expenditure forming the vertical axis and the annual depreciation calculated in respect of each annual capital expenditure amount forming the rows. The matrix once constructed is then copied for each asset class. If provision were to be made for 50 asset classes and the next 100 years within the model, then the calculation would require 5,000 rows and 100 columns (this is a small fraction of the 1,048,576 rows and 16,384 columns available within an Excel spreadsheet. Creating the necessary calculations is also very simple because the calculation is identical across assets and can simply been extended to the requisite number of assets.

2. Assessment of the AER approximate calculations

2.1 How the AER calculates depreciation for past capital expenditure

2.1.1 Structure of the Post Tax Revenue Model

19. The AER applies the Post Tax Revenue Model (PTRM) to derive allowed revenues for regulated firms, of which the allowance for regulatory depreciation is a component. The allowed revenues are used, in combination with other inputs, to generate the price controls that are specified as part of a regulatory determination.

20. The PTRM contains a simplified calculation of the regulatory depreciation that is attributable to assets that are in place prior to the new regulatory period (that is, the depreciation in respect of actual, past capital expenditure).[12] The depreciation calculation in the PTRM is structured on the assumption that all existing assets will be aggregated into a small number of classes (or groups),[13] and then the straight line depreciation method is applied as if each of these groups were a single asset. One common factor for each of the groups is that the depreciable life for new assets are identical. The regulatory depreciation allowance that is calculated for each of these groups for the first year of the new regulatory period depends upon two inputs:

    a. The starting regulatory value for the each of the groups of assets, which is the aggregate of the written down value of each of the assets (for regulatory purposes) within each group as at the start of the new regulatory period. This input is uncontentious, and

    b. The remaining life that is attributed to each of the groups of assets. The derivation of this input is one focus of this report.

21. The deprecation allowance for the first year of the new regulatory period for the group of assets is calculated as:[14]

$$Depreciation = \frac{Starting\ asset\ value\ (group)}{Starting\ remaining\ life\ (group)}$$

22. The calculation is then repeated over the remaining years of the new regulatory period, but with the asset value being reduced each year to remove depreciation in the previous year, and with the remaining life attributable to each group being reduced by "1" each year.

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12 Actual capital expenditure for the year prior to the commencement of a new regulatory period is typically unknown at the time that the new price controls are determined. This slight complication is ignored for simplicity in this report.

13 The number of such groups varies substantially across the regulated businesses, although for no apparent reason.

14 The formula here assumes that both the asset value and depreciation amount are specified in constant price (i.e., real or inflation-adjusted) terms. The PTRM in fact converts asset values into constant price terms and applies the calculation described here, and so this aspect of the issue is uncontentious.

23. I take it as common ground that applying the straight line depreciation method to groups of assets, rather than to individual assets, involves an approximation to the application of the straight line method and the resulting potential for error. A second focus of this report is whether such an approximation is justified is addressed in section 3 of this report.

2.1.2 AER method for deriving the remaining life of the groups

24. At the time of calculating the new price controls, two categories of assets that are relevant to this report exist:

    a. First, there are the groups of assets that were established at the commencement at the previous regulatory period.

    b. Secondly, there is the new expenditure associated with assets in each of the asset classes over the preceding regulatory period, separated into each of the years of the preceding period.

25. It is noted for completeness that the second category implies that individual assets within a class are grouped together with other assets in that class that were created during the same year. However, as discussed further in section 3, grouping assets in this manner generates little potential for error, and so is ignored in the discussion below.

26. The AER has proposed in the preliminary decision for SA Power Networks[15] that the "remaining life" for each of the groups of assets as at the start of the new regulatory period would be calculated by:

    a. taking the weighted average of the relevant remaining lives, with the weights employed in this calculation being the written down asset values of the relevant assets as at the end of the current regulatory period, and

    b. calculating the remaining lives for each of the groups of assets as:

        i. for the groups of assets that were established at the commencement at the previous regulatory period – the remaining life established at the commencement of the last regulatory period, minus 5, and

        ii. for the capital expenditure undertaken since that time – the remaining life of the individual assets, which in turn is a function of their year of construction and the depreciable life for the relevant asset class.

27. The AER described its method (which it labelled as the "weighted average remaining life", or WARL, method) in its own words as follows:[16]

This approach involves rolling forward from the approved remaining lives of existing assets at the start of the regulatory control period to the end of the regulatory control period. The remaining asset lives at the end of the regulatory control period for new assets acquired

[15] AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April.

[16] AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April, Attachment 5, p.5-12.

during the regulatory control period are also determined. The remaining lives of the existing assets and new assets at the end of the regulatory control period are then weighted based on their asset values, to come up with an average remaining life for the entire class. The remaining asset lives at the end of this period become the remaining asset lives at the start of the next regulatory control period.

28. It is noted that the AER's method involves a repeated grouping of assets at successive price reviews. Thus, while the depreciation on forecast capital expenditure is calculated on the basis of individual assets, the individual assets actually installed will be aggregated into the small number of groups at the next price review.

2.2 Objective when assessing the AER's calculations

29. I take it as given for this report that, when assessing the accuracy of approximations for the application of the straight line depreciation method, the appropriate comparison point is to the application of the method to assets individually. This would appear to be consistent with the AER's views, as reflected in the following comment:[17]

The remaining asset lives calculated by both the WARL and average depreciation approaches are not perfect compared with the approach of tracking assets individually. Some information is lost when assets are combined into a single asset class, and when new assets are added to that asset class. For this reason, we focus on the materiality of calculation distortions relative to the 'true' remaining asset lives (that is, remaining asset lives if assets were not aggregated into asset classes and they were not recalculated at each reset). [footnote omitted]

30. Applying the straight line depreciation to individual assets is consistent with my understanding of the standard practice in financial accounting,[18] where it is my understanding that information is typically captured and retained in businesses' information systems at this disaggregated level (with the information at the level of individual assets being referred to as the asset register).

31. In addition, I note that a desirable outcome for regulatory purposes of depreciating assets individually is that as replacement capital expenditure takes place and so enters the regulatory asset base, the asset being replaced is fully depreciated and so no longer reflected in the regulatory asset base.[19] The matching of expenditure being included in the regulatory asset base with assets becoming fully depreciated would be expected to smooth out cost-based prices over time. Indeed, under idealised circumstances, this matching under straight line depreciation would generate a time path for the capital

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17 AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April, Attachment 5, pp.5-12, 5-13.

18 Whilst this is beyond my area of expertise, I note that the guidance from the relevant accounting standard (AASB 116) regarding the recognition, carrying amounts, depreciation and impairment of property plant and equipment is framed as applying to individual assets, with the exception to this being that "[i]t may be appropriate to aggregate individually insignificant items, such as moulds, tools and dies, and to apply the criteria to the aggregate value" (AASB 116, principle 7).

19 In reality, this process would only be expected to occur on average, across a portfolio of assets because the service lives of assets individual assets would be expected to vary around the expected life.

component in prices that follows the growth in capital input prices.[20] For this matching to occur, depreciation needs to reflect the circumstances of the individual assets.

32. Accordingly, in my assessment of the AER's method of deriving the regulatory depreciation allowance, I have focussed on how the AER's method compares with a calculation performed at the level of individual assets. I refer to this measure in the text as the "accuracy" of the AER's calculation; however, I observe for completeness that I am only assessing the accuracy with which the straight line depreciation method is being applied and am not assessing the appropriateness of the choice of that method, nor the appropriateness of the inputs applied (most notably the choice of economic lives for individual assets).

2.3 Results of mathematical analysis

2.3.1 Tasks undertaken

33. I have first assessed whether the AER's method for deriving the remaining lives for the groups of assets is accurate by analysing the issue mathematically, the full workings for which is set out in Appendix A. The questions that I have sought to answer are as follows:

a. First, in the context of the AER's calculation of regulatory depreciation in the PTRM, which method for deriving the remaining lives for a group of assets will result in the most accurate calculation of straight line for a base year (I refer to this as the "accurate" remaining life).

b. Secondly, whether, once the remaining life for a base year is calculated, it is correct to reduce the remaining life by "1" each year when calculating regulatory depreciation (and the circumstances in which this will no longer be correct).

c. Thirdly, to assess how the AER's calculation of the remaining life (and thereby the regulatory depreciation allowance) compares to the accurate result that I have derived.

2.3.2 Method for deriving the remaining life for a group

34. In relation to the first of these tasks, I have established that the method for deriving the remaining life for a group of assets that results in the most accurate calculation of depreciation is to follow a two-step procedure, which is to:[21]

a. First calculate the weighted average depreciating rate for the assets in the group, where the depreciation rate for an asset is the reciprocal of its remaining life and the

[20] This outcome results under the following assumptions: (i) for each type of asset, the business has a portfolio of assets of different vintages with an equal spread across all vintages (implying, amongst other things, that the business is older than the service life of the oldest assets), (ii) either no growth or no economies of scale from serving new growth, and (iii) a constant required return on equity (inclusive of tax).

[21] This is established in section A.2.

regulatory values of the assets (i.e., written down values) are used as the weighting variable, and

b. Secondly, to set the remaining life for the group of assets equal to the reciprocal of the weighted average depreciation rate for the group, as calculated above.

35. This calculation differs to the AER method in that a weighted average depreciation rate for the group is first calculated (and, from this, a remaining life), whereas the AER method involves calculating a weighted average remaining life for the group directly. These calculations deliver different results, and in my view the AER's method contains a mathematical error, which I return to below.

36. As an alternative, I also show that the accurate remaining life for a group for a particular year can also be calculated directly, but it requires the depreciation for the year in question (rather than the regulatory values of the assets) to be used as the weighting variable.[22] Thus, an alternative means of expressing the source of the error in the AER calculation is that it has employed the incorrect weighting variable when deriving the weighted average remaining life for the groups of assets.

2.3.3 Projecting the remaining life for the group of assets into future years

37. Subject to the caveat below, I find that the AER is correct to assume that the remaining life for the group of assets will reduce by "1" each year, provided that the starting life for the group of assets is accurately established at the outset.

38. The caveat to this is that the projection of the remaining life of the group of assets into future years will only remain accurate until the point where individual assets within the group would have been fully depreciated. After that time, the remaining life calculated using the method described above will understate the accurate remaining life of the group (and so overstate the accurate depreciation allowance). I observe, however, that it is complex to adjust the calculation of depreciation when undertaken for groups of assets for the prospect that individual assets would have been fully depreciated, without first calculating the depreciation that would have been derived of the method had been applied to assets individually.

2.3.4 Comparison with the AER's method

39. I have also compared the remaining lives for groups of assets calculated according to my method with the remaining lives that are calculated according to the AER's method. As discussed above, the difference between the methods can be expressed as either that:

a. the AER calculates a weighted average remaining life directly (using asset values as weights), whereas it should have first calculated the weighted average depreciation rate for each group, and then set the remaining life for each group equal to the reciprocal of this, or

[22] This is established in section A.5.

b. the AER's weighted average remaining life calculation incorrectly uses asset values as weights, whereas depreciation amounts in the base year should have been used.

40. I find that,[23] with the exception of a special case, the AER method will result in a greater remaining life than the accurate value, and so will understate the depreciation that would result from applying the straight line method to individual assets. The special case is where all assets in the class have the same remaining life, in which the two methods deliver an identical result.

2.3.5 Limitations to the use of an approximate depreciation calculation

41. As I have commented upon above, my derivation of the formulae for establishing the accurate remaining lives for the groups and for projecting this over time rest on the assumption that none of the assets in the groups would have been fully depreciated if the straight line method had been applied to assets individually. A consequence of this simplification is that, after the time when individual assets would have commenced being full depreciated under an individual-asset calculation, the method that I have set out will understate the accurate remaining life for the group (and so overstate depreciation).

42. I have also concluded that the AER method will overstate the accurate remaining life of the group. However, this conclusion too is dependent upon the assumption that individual assets would not have been fully depreciated. The upward bias in the AER formula would reduce as individual assets commence being fully depreciated assets, and past some point the bias would be expected to reverse (and the AER method would then overstate the required depreciation) as the new error works in the opposite direction to the original error.

43. Indeed, these outcomes are quite consistent with the AER's own simulations that it presented in the Figure 5.1 of its preliminary decision for SA Power Networks, which showed that:

a. In relation to the remaining lives proposed by SA Power Networks the figure suggests that its method produced a very similar outcome for the first 10 years to what would be produced if depreciation was calculated for assets individually; however, from year 11 onwards its method overstated depreciation. The figure shows, however, that the problem with the SA Power Networks approximation is that it did not follow the substantial step-down in the individual-asset depreciation that would be calculated from year 11 onwards. This step-down clearly is the result of the existing assets at the start of the 2015-20 period becoming fully depreciated under an individual-asset depreciation calculation.

b. In contrast, the AER method resulted in a materially lower depreciation allowance for the first 10 years than the correct value, and then produces a higher depreciation allowance from year 11 onwards.[24] The consequence of this is – which is shown in the

[23] This is established in section A.4.

[24] This conclusion is reached by comparing the slope of the RAB function under the AER method to the slope under the individual asset calculation. The AER function is initially flatter; however, it becomes steeper after the kink in the individual asset RAB function after year 10.

figure – is that the AER method results in the RAB value exceeding the correct value for the first 23 years, and then being lower than the correct value from that point onwards.

44. In my view, it is apparent that both approaches for generating an approximate calculation of straight line depreciation contain potential errors. Indeed, the AER's calculations suggest that in the case of SA Power Networks and the next regulatory period, the error could be very material.[25] It is not easy, however, to correct the formula derived in this report to address the effect of individual assets becoming fully depreciated for the remaining life for the group. Similarly, correcting the AER's formula would imply using the formula that I have derived in this report to correct its inherent flaw, and so it offers no easier prospect for deriving an accurate approximation.

45. Accordingly, a more appropriate course of action would be to change the structure of the PTRM to collect more information from previous periods and to use this in the calculation of regulatory depreciation. I set out my views on possible options in the next section.

[25] The method that SA Power Networks applied is very similar to what I derive as the correct approach in this report. The AER's preliminary decision led to materially different asset lives for some asset classes, and amounted to a difference in the revenue requirement of $320 million for the forthcoming regulatory period (AER, 2015, Preliminary Decision: SA Power Networks Determination 2015/16 to 2019/20, April, Attachment 5, Table 5.3 and p.5-14).

3. Improvements on the approximate depreciation calculations

46. In the previous section I concluded that an approximate calculation of straight line depreciation brings with it the prospect of error. While I concluded that the AER's method contains an inherent flaw, the formula that I derive will also produce an incorrect result after the time when individual assets within the group would have been fully depreciated if depreciation was applied on an individual asset basis.

47. Given this, a more appropriate course of action, in my view, would be to use more information about historical capital expenditure when calculating the regulatory depreciation allowances.

48. I note at the outset that under the method that the AER derives regulated prices, there is no loss of information caused by aggregating together expenditure on individual assets that is undertaken in a particular year and that corresponds to a particular class (with one characteristic being the same depreciable life). I say this because the AER's method involves commencing depreciation from the next year after the relevant asset has entered into service.[26] Accordingly, all assets within a class created in a particular year must have the same depreciable life (and so depreciate at the same time).

49. I can think of three broad methods for employing more information in the calculation of regulatory depreciation, which are as follows.

    a. *Group assets created within a particular regulatory period* – the first option would be to continue to group past expenditures, but to only group expenditures that were undertaken during a given regulatory period (that is, do not add past period capital expenditure to an existing group, instead create a new group). Thus, if there were six expenditure classes, then six new groups would be created at the end of each regulatory period. The formulae that I have set out in this report for deriving the remaining lives of each group would be applied. This option could be applied with very little structural change to the existing PTRM.

        i. This approximate calculation of depreciation would continue to generate the wrong depreciation allowance after assets within the group would have been fully depreciated.

        ii. However, the error would be contained to a five-year period (representing the spread of the remaining asset lives). In addition, if the current practice of rounding standard lives to the nearest five years were to continue, then all of error would be concentrated within a given regulatory period, and consequently have no effect on prices.[27]

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26 The AER assumes that the expenditure occurs on average at the midpoint of the year and capitalises half a year of return into the starting value of the RAB. The veracity of that timing assumption is not relevant to the matters considered in this report.

27 That is, depreciation would be too high for the first part of the period and too low for the second part; however, the effect of smoothing revenue in present value terms over the period means that the price would not unaffected by this error.

b. *Continue the treatment in relation to forecast capital expenditure* – that is, continue the current practice of grouping together the annual capital expenditure of a particular expenditure class,[28] and continue to calculate depreciation for these separate groups into the into future regulatory periods (that is, after replacing the forecast of capital expenditure with the actual amount).[29]

c. *Provide for depreciation on past expenditure to be an input in the PTRM* – and instead rely upon the regulated business's own business systems to keep track of the calculation of depreciation in relation to assets installed in previous regulatory periods. The PTRM could still calculate the depreciation in relation to forecast capital expenditure, and so provide the AER with the means to adjust depreciation for changes to forecasts of capital expenditure.

50. All of these options are feasible – and indeed none would be particularly difficult to implement – and all would be an improvement on the current practice of grouping past expenditures and undertaking an approximate calculation of depreciation.[30] Of the options, my preference would be the second because it would leave the PTRM self-contained, not require any additional information to that already reported to the AER, not lead to any relevant information being sacrificed and remain straightforward to implement. This practice is also consistent with how the Economic Regulatory Authority of Western Australia has calculated depreciation in its past decisions.

51. The one exception to the conclusion above would be if the AER was to change how it recognised the timing of expenditure, and to seek to commence depreciation from when an asset had actually entered into service during a particular year.[31] In this case, calculations at the level of individual assets would be required, and it would be sensible then to rely upon the businesses' business systems for this purpose.[32]

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28 I am assuming that one characteristic of each class is that all assets within the class that are created within a particular year have the same economic life.

29 I understand that other distributors separate their assets into a larger number of classes, for example with AusGrid using 20 asset classes and SA Power Networks using 17. However, keeping track of depreciation on annual expenditures across 50 asset classes would remain a very simple task in Excel given that the structure of calculations across the asset classes is identical.

30 All of these options would also work equally well with the use of a forecast depreciation, which (as I understand it is proposed to be implemented) would require a step change in depreciation at the start of the next regulatory period to accommodate any difference between forecast and actual depreciation.

31 This is the practice of the Commerce Commission in New Zealand, and as a consequence it relies upon the businesses' accounting systems to keep track of depreciation on existing assets.

32 In my experience, regulated businesses would normally capture the quarter in which an asset was created, and sometimes the month.

4. Declaration

52. I have has made all of the inquiries that I believe to be desirable and appropriate in the preparation of this report and no matters of significance that I regard as relevant have, to my knowledge, been withheld.

Jeffrey John Balchin
13 July 2015

A. Demonstration of the mathematical results in relation to depreciation

A.1 Definitions

53. The variables used in this appendix are defined as follows:

a. V_t^i = regulatory value (written down) of asset *i* at the start of year *t*

b. RL_t^i = remaining life of asset *i* at the start of year *t*

c. R_t^i = rate of depreciation for asset *i* in year *t*

d. D_t^i = depreciation of asset *i* in year *t*

54. Straight line depreciation is assumed. All variables are also assumed to be specified in constant price terms (that is, in terms of the general price level prevailing at a common point in time).

55. It follows from the definitions and assumptions set out in the above paragraphs that:[33]

a. $D_t^i = \frac{V_t^i}{RL_t^i} = V_t^i \cdot R_t^i$, and

b. $R_t^i = {}^1/_{RL_t^i}$

c. $RL_{t+1}^i = RL_t^i - 1$,[34] and

d. $V_{t+1}^i = V_t^i - D_t^i = V_t^i(1 - R_t^i) = V_t^i\left(1 - {}^1/_{RL_t^i}\right)$

A.2 Proposition 1 – derivation of the "accurate" remaining life for a group

56. It is assumed that a group of assets will be created (spanning assets $i = 1$ to I). The objective is to derive a remaining life value for the group of assets for year *t* (denoted RL_t^*) such that, when this life is to the aggregate value of assets in a class, generates the same depreciation value as the sum of the depreciation values that are calculated for each asset individually. That is:

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33 These definitions – and the associated formulae – all assume that the asset in question has at least 1 year of service life remaining. In practice, depreciation is the lesser of the value provided by the relevant formulae and the written down value of the asset at the start of the year in question, so that the written down value of the asset cannot be less than zero. The implications of assets becoming fully depreciated for the formulae that I derive are addressed separately below.

34 A corollary of this is that the depreciation rate for any asset will increase as the remaining life of the asset reduces.

$$\frac{1}{RL_t^*}\sum_{i=1}^{I} V_t^i = \sum_{i=1}^{I} \frac{V_t^i}{RL_t^i}$$

57. Starting with the right hand side, if we substitute the depreciation rates for the individual assets, then this becomes:

$$\sum_{i=1}^{I} \frac{V_t^i}{RL_t^i} = \sum_{i=1}^{I} V_t^i \cdot R_t^i$$
$$= \sum_{i=1}^{I} V_t^i \cdot R_t^i \cdot \left(\frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i}\right)$$
$$= \frac{\sum_{i=1}^{I} V_t^i \cdot R_t^i}{\sum_{i=1}^{I} V_t^i} \cdot \sum_{i=1}^{I} V_t^i = R_t^* \cdot V_t^*$$

58. The result immediately above implies that the accurate depreciation value for year *t* for the group of *I* assets can be obtained by applying the weighted average depreciation rate for year t (denoted R_t^*) to the aggregate (written down) value of the assets at the start of year *t* (denoted V_t^*), with the individual asset values used as the weights to calculate the depreciation rate. It follows from this that the accurate depreciation value for year *t* will be calculated if a remaining life for the group of assets is used that is calculated as the reciprocal of the weighted average depreciation rate set out above, that is:

$$RL_t^* = 1 \Big/ \frac{\sum_{i=1}^{I} V_t^i \cdot R_t^i}{\sum_{i=1}^{I} V_t^i} = \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i \cdot R_t^i} = \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i \Big/ RL_t^i}$$

59. The formula above says that the accurate remaining life for the group of assets is derived as a two-step calculation, namely to:

a. First derive the weighted average depreciation rate, and

b. Secondly, set the remaining life for the group of assets equal to the reciprocal of this depreciation rate.

60. The AER's approach, in contrast, was to calculate the remaining life for the group of assets by calculating the weighted average of the individual assets' remaining lives directly. Apart from the special case where all assets have the same remaining life, this will result in a different value for the remaining life than when using the formula above, and so will not generate an accurate value for depreciation for the year in question, and so is mathematically incorrect. The direction of the error is addressed in section A.4 below.

A.3 Proposition 2 – does the (accurate) remaining life reduce by "1" each year?

61. The AER's approximate calculation of depreciation assumes that the remaining life of each group of assets will reduce by "1" each year. The purpose of this section is to assess whether this is a correct assumption, assuming that the remaining life is established accurately at the outset.

62. It was shown above that the accurate remaining life for the group of *I* assets is given by:

$$RL_t^* = \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i / RL_t^i}$$

63. It also follows that:

$$RL_{t+1}^* = \frac{\sum_{i=1}^{I} V_{t+1}^i}{\sum_{i=1}^{I} V_{t+1}^i / RL_{t+1}^i}$$

64. However, it is also the case that:

a. $RL_{t+1}^i = RL_t^i - 1$, and

b. $V_{t+1}^i = V_t^i \left(1 - 1/RL_t^i\right)$

65. Substituting these expressions into the formula above yields:

$$RL_{t+1}^* = \frac{\sum_{i=1}^{I} V_t^i \cdot \left(1 - \frac{1}{RL_t^i}\right)}{\sum_{i=1}^{I} V_t^i \cdot \left(1 - \frac{1}{RL_t^i}\right) \cdot \left(\frac{1}{RL_t^i - 1}\right)}$$

66. Manipulation of this expression yields:

$$RL_{t+1}^* = \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i / RL_t^i} - 1 = RL_t^* - 1$$

67. It follows that, subject to the caveat below, the "accurate" remaining life for the group of assets will reduce by "1" each year.

68. The caveat to this is that the expression above assumes that the remaining life for each individual asset in the group is at least 1 year (meaning to that no asset has become fully

depreciated, or indeed there is a negative written down value).[35] It is reasonably straightforward to show that the simple expression above will overstate the decline in the "accurate" remaining life of the group after the time that individual assets in the group would have become fully depreciated.

A.4 Proposition 3 – relationship between the AER weighted average life and the accurate average life

69. Recall from above that the accurate remaining life for the group of assets is given by the following:

$$RL_t^* = \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i / RL_t^i}$$

70. This compares to the formula that the AER applied, which is as follows:

$$RL_t^{AER} = \frac{\sum_{i=1}^{I} RL_t^i \cdot V_t^i}{\sum_{i=1}^{I} V_t^i}$$

71. The AER formula for calculating remaining life will calculate a different value to the correct formula, except where the remaining life of the assets is identical. In all other cases, the error in using the AER formula will be positive. The error is demonstrated by setting out the formula for the difference between the two methods:

$$RL_t^{Error} = RL_t^{AER} - RL_t^* = \frac{\sum_{i=1}^{I} RL_t^i \cdot V_t^i}{\sum_{i=1}^{I} V_t^i} - \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} V_t^i / RL_t^i}$$

72. In order to simplify the demonstration, it is assumed below that there are only two assets that are to be grouped. This does not affect the generality of the results because a group of *n* assets can be thought of as a group that comprises *(n-1)* sequential groupings of assets.[36] In the two asset case, the error in the AER's remaining life will be given by:

$$RL_t^{Error} = \frac{V_t^1 \cdot RL_t^1 + V_t^2 \cdot RL_t^2}{V_t^1 + V_t^2} - \frac{V_t^1 + V_t^2}{\frac{V_t^1}{RL_t^1} + \frac{V_t^2}{RL_t^2}}$$

73. If this expression is expanded and simplified, it reduces to the following:

35 The condition that the remaining life be at least 1 year means the same thing as the asset not being fully depreciated (or attracting a negative value) if the standard lives for individual assets are specified in terms of whole years.

36 That is, with two assets grouped, and then that group combined with the third asset, and so forth.

$$RL_t^{Error} = \frac{(RL_t^1 - RL_t^2)^2}{RL_t^1\left(\frac{V_t^1 + V_t^2}{V_t^1}\right) + RL_t^2\left(\frac{V_t^1 + V_t^2}{V_t^2}\right)}$$

74. The bottom line of this expression is strictly positive, provided that the written down values of each of the assets remain greater than zero (otherwise it is undefined). Subject to this condition, the top line of the expression means that:

    a. If the remaining life of the assets are identical, then the AER formula will give the correct result, and

    b. In all other cases, the error in using the AER formula will be positive – that is, the AER formula will overstate the accurate remaining life of the group of assets, and so understate the regulatory depreciation that would result from applying the straight line method to assets individually.

75. Again, it is noted that this conclusion rests on the assumption that no asset in the group would have been fully depreciated if depreciation was applied on an individual asset basis.

A.5 Proposition 4 – alternatively, the correct weights for calculating the remaining life of a group of assets is the annual depreciation values (rather than the written down value)

76. I have defined the "accurate" remaining life for a group of assets as the life that results in the depreciation calculated for a group of assets to equate to the aggregate of the depreciation values that would be calculated for each asset individually. Thus, the objective is to find RL_t^* such that:

$$\frac{\sum_{i=1}^{I} V_t^i}{RL_t^*} = \sum_{i=1}^{I} D_t^i$$
$$\Rightarrow RL_t^* = \frac{\sum_{i=1}^{I} V_t^i}{\sum_{i=1}^{I} D_t^i}$$

77. Noting that:

$$V_t^i = D_t^i \cdot RL_t^i$$

78. Substituting this into the previous expression yields:

$$RL_t^* = \frac{\sum_{i=1}^{I} D_t^i \cdot RL_t^i}{\sum_{i=1}^{I} D_t^i}$$

79. This expression implies that an alternative method of calculating the "correct" remaining life for the group for year *t* is to calculate the weighted average of the individual asset remaining lives, using the calculated depreciation for each asset for year *t* as the weights.

80. It can be further observed that the only circumstance where using depreciation as the weighting variable will result in the same (weighted average) remaining life that is derived when using asset values as the weighting variable (i.e., the AER's method) is where (for all *i*):

$$\frac{D_t^i}{\sum_{i=1}^{I} D_t^i} = \frac{V_t^i}{\sum_{i=1}^{I} V_t^i}$$

81. Again, noting that:

$$V_t^i = D_t^i \cdot RL_t^i$$

82. The condition above can be re-expressed as:

$$\left(\sum_{i=1}^{I} D_t^i . RL_t^i\right) = \left(\sum_{i=1}^{I} D_t^i\right) \cdot RL_t^i$$

83. This condition will only be met if the remaining lives are the same for every asset. Thus, this second method of calculating the remaining life leads to the same result reached previously, namely that the AER method will only produce the accurate remaining life for a group of assets in the special case where each asset has the same remaining life.

B. Curriculum vitae

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Jeff is the Managing Director of Incenta Economic Consulting. Jeff has 20 years of experience in relation to economic regulation issues across the electricity, gas, ports, airports, rail, water and telecommunications sectors in Australia and New Zealand. He has advised governments, regulators and major corporations on issues including the development of regulatory frameworks, regulatory price reviews and issues around the introduction and measurement of competition (including franchise bidding). His particular specialities have been on the application of finance principles to economic regulation, the design of incentive compatible regulation and efficient tariff structures and the drafting and economic interpretation of regulatory instruments.

In addition, Jeff has substantial experience with the application of economic and finance principles to pricing and investment appraisal and associated commercial disputes in unregulated infrastructure and non-infrastructure markets. He has also assisted with applying economic principles to transfer pricing.

Jeff has undertaken a number of expert witness assignments.

Past positions

Jeff previously was a Principal at PwC in its economics and policy team for almost 4 years, prior to that a director and partner at the Allen Consulting Group for over 13 years, and prior that he held a number of policy positions in the Commonwealth Government. In this latter role, he was on the secretariat of the Gas Reform Task Force (1995-1996), where he played a lead role in the development of the National Gas Code.

Relevant experience

A. Economic regulation of network / monopoly activities

Assistance to parties during price reviews/negotiations

- Regulatory valuation of telecommunications local loop assets (Client: Chorus, 2014) – prepared a report advising on the appropriate valuation of local loop assets for the purpose of deriving a TSLRIC price for unbundled local loop access.
- Design of incentives for operating expenditure efficiency (Client: ElectraNet, 2012-13) – provided expert advice on the detailed application of the incentive arrangements for operating expenditure, including the link between the incentive scheme and the forecasting method.
- Regulatory depreciation (Client: APA, 2012-13) – provided expert reports on the economic principles relevant to the depreciation method that is applied to set gas transmission charges.
- Regulatory cost of debt (Clients: Powerlink, ElectraNet and Victorian gas distributors 2011-2012) – provided a series of reports addressing how the benchmark cost of debt should be established pursuant to the National Electricity Rules and on the appropriate benchmark allowance for debt and equity raising costs.
- Real cost escalation (Client: Energex, 2009-10) – advised Energex on appropriate escalators to apply to forecasts of operating and capital expenditure over the regulatory period.

- Strategic advice, Victorian electricity distribution review and NSW gas distribution review (Client: Jemena Electricity Networks, 2009-2011) – retained as strategic adviser during the review and also provided advice on a range of technical regulatory economic issues, including on regulatory finance matters, service incentives, party contracts, allocation of costs between regulated and unregulated activities and forecasting of expenditure.
- Regulatory cost of debt (Client: Powercor Australia Limited, 2009-2010) – provided a series of reports addressing how the benchmark cost of debt should be established pursuant to the National Electricity Rules.
- Service incentive scheme (Client: Powercor Australia Limited, 2010) – assisted Powercor to quantify the financial effect that would have flowed if the former service performance incentive scheme had continued. Also prepared an expert report pointing to a material inconsistency in how the AER intended to close out the old scheme and the parameters for the new service performance incentive scheme, which was accepted by the AER.
- Input methodologies for NZ regulated businesses (Clients: Powerco NZ and Christchurch International Airport, 2009-2012) – advised in relation to the Commerce Commission's development of input methodologies, focussing asset valuation, the regulatory cost of capital, the use of productivity trends in regulation and the design of incentive-compatible regulation. Also assisted in briefing counsel in subsequent reviews.
- Commercial negotiation of landing charges (Client: Virgin Blue, 2009-2012) – economic advice to Virgin Blue during its commercial negotiation of landing charges to a number of major and secondary airports.
- Equity Betas for Regulated Electricity Transmission Activities (Client: Grid Australia, APIA, ENA, 2008) – Prepared a report presenting empirical evidence on the equity betas for regulated Australian electricity transmission and distribution businesses for the AER's five yearly review of WACC parameters for these industries. The report demonstrated the implications of a number of different estimation techniques and the reliability of the resulting estimates. Also prepared a joint paper with the law firm, Gilbert+Tobin, providing an economic and legal interpretation of the relevant (unique) statutory guidance for the review.
- Economic Principles for the Setting of Airside Charges (Client: Christchurch International Airport Limited, 2008-2013) – Provided advice on a range of economic issues relating to its resetting of charges for airside services, including the valuation of assets and treatment of revaluations, certain inputs to the cost of capital (beta and the debt margin) and the efficiency of prices over time and the implications for the depreciation of assets and measured accounting profit.
- Treatment of Inflation and Depreciation when Setting Landing Charges (Client: Virgin Blue, 2007 2008) – Provided advice on Adelaide Airport's proposed approach for setting landing charges for Adelaide Airport, where a key issue was how it proposed to deal with inflation and the implications for the path of prices over time. The advice also addressed the different formulae that are available for deriving an annual revenue requirement and the requirements for the different formulae to be applied consistently.
- Application of the Grid Investment Test to the Auckland 400kV Upgrade (Client: Electricity Commission of New Zealand, 2006) - As part of a team, undertook a review of the Commission's process for reviewing Transpower's proposed Auckland 400kV upgrade project and undertook a peer review of the Commission's application of the Grid Investment Test.

- Appropriate Treatment of Taxation when Measuring Regulatory Profit (Client: Powerco New Zealand, 2005 2006) - Prepared a series of statements on how taxation should be treated when measuring realised and projected regulatory profit.
- Application of Directlink for Regulated Status (Client: Directlink, 2003-2004) – Prepared advice on the economic efficiency of the conversion of an unregulated (entrepreneurial) interconnector to a regulated interconnector and how the asset should be valued for pricing purposes.
- Principles for the 'Stranding' of Assets by Regulators (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2005) - Prepared a report discussing the relevant economic principles for a regulator in deciding whether to 'strand' assets for regulatory purposes (that is, to deny any further return on assets that are partially or unutilised).
- Principles for Determining Regulatory Depreciation Allowances (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2003) - Prepared a report discussing the relevant economic and other principles for determining depreciation for the purpose of price regulation, and its application to electricity distribution. An important issue addressed was the distinction between accounting and regulatory (economic) objectives for depreciation.
- Methodology for Updating the Regulatory Value of Electricity Transmission Assets (Client: the Australian Competition and Consumer Commission, 2003) - Prepared a report assessing the relative merits of two options for updating the regulatory value of electricity transmission assets at a price review - which are to reset the value at the estimated 'depreciated optimised replacement cost' value, or to take the previous regulatory value and deduct depreciation and add the capital expenditure undertaken during the intervening period (the 'rolling-forward' method). This paper was commissioned as part of the ACCC's review of its Draft Statement of Regulatory Principles for electricity transmission regulation.
- Application of Murraylink for Regulated Status (Client: Murraylink Transmission Company, 2003) – Prepared advice on the economic efficiency of the conversion of an unregulated (entrepreneurial) interconnector to a regulated interconnector and how the asset should be valued for pricing purposes.
- Proxy Beta for Regulated Gas Transmission Activities (Client: the Australian Competition and Consumer Commission, 2002) - Prepared a report presenting the available empirical evidence on the 'beta' (which is a measure of risk) of regulated gas transmission activities. This evidence included beta estimates for listed firms in Australia, as well as those from the United States, Canada and the United Kingdom. The report also included a discussion of empirical issues associated with estimating betas, and issues to be considered when using such estimates as an input into setting regulated charges.
- Treatment of Working Capital when setting Regulated Charges (Client: the Australian Competition and Consumer Commission, 2002) - Prepared a report assessing whether it would be appropriate to include an explicit (additional) allowance in the benchmark revenue requirement in respect of working capital when setting regulated charges.
- Pricing Principles for the South West Pipeline (Client: Esso Australia, 2001) - As part of a team, prepared a report describing the pricing principles that should apply to the South West Pipeline (this gas transmission pipeline was a new asset, linking the existing system to a new storage facility and additional gas producers).
- Likely Regulatory Outcome for the Price for Using a Port (Client: MIM, 2000) - Provided advice on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issue of contention was the valuation of the port

assets (for regulatory purposes) given that the installed infrastructure was excess to requirements, and the mine had a short remaining life.

- Relevance of 'Asymmetric Events' in the Setting of Regulated Charges (Client: TransGrid, 1999) - In conjunction with William M Mercer, prepared a report (which was submitted to the Australian Competition and Consumer Commission) discussing the relevance of downside (asymmetric) events when setting regulated charges, and quantifying the expected cost of those events.

Major roles for regulators

- Aurizon Network price review (Client: Queensland Competition Authority, 2013-14) – advised the QCA on the appropriate rate of return (discount rate) for the Aurizon Network business, which included an assessment of the relative risk of Aurizon Network compared to other infrastructure sectors, advice on the appropriate benchmark gearing level and on the benchmark debt interest rate.
- Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2006 2008) - Provided advice to the Essential Service Commission in relation to its review of gas distribution access arrangements on the treatment of outsourcing arrangements, finance issues, incentive design and other economic issues.
- Envestra Gas Distribution Price Review (Client: the Essential Services Commission, SA, 2006) - Provided advice on several finance related issues (including 'return on assets' issues and the financial effect of Envestra's invoicing policy), and the treatment of major outsourcing contracts when setting regulated charges.
- DBCT price review (Client: QCA, Qld, 2004-2006) – advice on a number of finance related issues, including the calculation of IDC for a DORC valuation, cost of debt and equity beta.
- Victorian Electricity Distribution Price Review (Client: the Essential Services Commission, Vic, 2003 2005) - Provided advice to the Essential Service Commission on a range is economic issues related to current review of electricity distribution charges, including issues related to finance, forecasting of expenditure and the design of incentive arrangements for productive efficiency and service delivery. Was a member of the Steering Committee advising on strategic regulatory issues.
- Victorian Water Price Review (Client: the Essential Services Commission, Vic, 2003 2005) - Provided advice to the Essential Services Commission on the issues associated with extending economic regulation to the various elements of the Victorian water sector. Was a member of the Steering Committee advising on strategic regulatory issues, and also provided advice on specific issues, most notably the determination of the initial regulatory values for the water businesses and the role of developer charges.
- ETSA Electricity Distribution Price Review (Client: the Essential Services Commission, SA, 2002 2005) - Provided advice on the 'return on assets' issues associated with the review of ETSA's regulated distribution charges, including the preparation of consultation papers. The issues covered include the valuation of assets for regulatory purposes and cost of capital issues. Also engaged as a quality assurance adviser on other consultation papers produced as part of the price review.
- Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2001 2002) - Economic adviser to the Essential Services Commission during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Was responsible for all issues associated with capital financing (including analysis of the cost of capital and assessment of risk generally, and asset valuation), and supervised the financial modelling and derivation of regulated charges. Also advised on a number of other issues, including the design of

incentive arrangements, the form of regulation for extensions to unreticulated townships, and the principles for determining charges for new customers connecting to the system.

- ETSA Electricity Distribution Price Review (Client: the South Australian Independent Industry Regulator, 2000 2001) - As part of a team, prepared a series of reports proposing a framework for the review. The particular focus was on the design of incentives to encourage cost reduction and service improvement, and how such incentives can assist the regulator to meet its statutory obligations. Currently retained to provide commentary on the consultation papers being produced by the regulator, including strategic or detailed advice as appropriate.
- Dampier to Bunbury Natural Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000 2002) - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.
- Goldfield Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000 2004) - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.
- Victorian Electricity Distribution Price Review (Client: the Office of the Regulator General, Vic, 1999 2000) - Economic adviser to the Office of the Regulator General during its review of the price caps for the five Victorian electricity distributors. Had responsibility for all issues associated with capital financing, including analysis of the cost of capital (and assessment of risk generally) and asset valuation, and supervised the financial modelling and derivation of regulated charges. Also advised on a range of other issues, including the design of incentive regulation for cost reduction and service improvement, and the principles for determining charges for new customers connecting to the system.
- Victorian Ports Corporation and Channels Authority Price Review (Client: the Office of the Regulator General, Vic, 2000) - Advised on the finance related issues (cost of capital and the assessment of risk generally, and asset valuation), financial modelling (and the derivation of regulated charges), and on the form of control set over prices. Principal author of the sections of the draft and final decision documents addressing the finance related and price control issues.
- AlintaGas Gas Distribution Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999 2000) - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline. This advice included providing a report assessing the cost of capital associated with the regulated activities, overall review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.
- Parmelia Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999 2000) - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft and final decisions, with particular

focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.

- Victorian Gas Distribution Price Review (Client: the Office of the Regulator General, Vic, 1998) - Economic adviser to the Office of the Regulator General during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Major issues addressed included the valuation of assets for regulatory purposes, cost of capital financing and financial modelling. Principal author of the draft and final decision documents.

Development/Review of Regulatory Frameworks

- Review of the Australian energy economic regulation (Client: Energy Networks Association, 2010-2012) – assisting the owners of energy infrastructure to engage in the current wide-ranging review of the regime for economic regulation of energy infrastructure. Advice has focussed in particular on the setting of the regulatory WACC and on the regime of financial incentives for capital expenditure efficiency, and included strategic and analytical advice, preparation of expert reports and assistance with ENA submissions.
- Review of the Australian electricity transmission framework (Client: Grid Australia, 2010-2013) – assisting the owners of electricity transmission assets to participate in the wide-ranging review of the framework for electricity transmission in the national electricity market, covering such matters as planning arrangements, the form of regulation for non-core services and generator capacity rights and charging. Has included analytical advice on policy choices, facilitation of industry positions and articulation of positions in submissions.
- Implications of greenhouse policy for the electricity and gas regulatory frameworks (Client: the Australian Energy Market Commission, 2008-2009) – Provided advice to the AEMC in its review of whether changes to the electricity and gas regulatory frameworks is warranted in light of the proposed introduction of a carbon permit trading scheme and an expanded renewables obligation. Issues addressed include the framework for electricity connections, the efficiency of the management of congestion and locational signals (including transmission pricing) for generators and the appropriate specification of a cost benefit test for transmission upgrades in light of the two policy initiatives.
- Economic incentives under the energy network regulatory regimes for demand side participation (Client: Australian Energy market Commission, 2006) – Provided advice to the AEMC on the incentives provided by the network regulatory regime for demand side participation, including the effect of the form of price control (price cap vs. revenue cap), the cost-efficiency arrangements, the treatment of losses and the regime for setting reliability standards.
- Implications of greenhouse policy for the electricity and gas regulatory frameworks (Client: the Australian Energy Market Commission, 2008) - Provided advice to the AEMC in its review of whether changes to the electricity and gas regulatory frameworks is warranted in light of the proposed introduction of a carbon permit trading scheme and an expanded renewables obligation. Issues addressed include the framework for electricity connections, the efficiency of the management of congestion and locational signals for generators and the appropriate specification of a cost benefit test for transmission upgrades in light of the two policy initiatives.
- Application of a 'total factor productivity' form of regulation (Client: the Victorian Department of Primary Industries, 2008) - Assisted the Department to develop a proposed amendment to the regulatory regime for electricity regulation to permit (but not mandate) a total factor productivity approach to setting price caps – that is, to reset prices to cost at the start of the new regulatory

period and to use total factor productivity as an input to set the rate of change in prices over the period.

- Expert Panel on Energy Access Pricing (Client: Ministerial Council on Energy, 2005 2006) - Assisted the Expert Panel in its review of the appropriate scope for commonality of access pricing regulation across the electricity and gas, transmission and distribution sectors. The report recommended best practice approaches to the appropriate forms of regulation, the principles to guide the development of detailed regulatory rules and regulatory assessments, the procedures for the conduct of regulatory reviews and information gathering powers.
- Productivity Commission Review of Airport Pricing (Client: Virgin Blue, 2006) - Prepared two reports for Virgin Blue for submission to the Commission's review, addressing the economic interpretation of the review principles, asset valuation, required rates of return for airports and the efficiency effects of airport charges and presented the findings to a public forum.
- AEMC Review of the Rules for Setting Transmission Prices (Client: Transmission Network Owners, 2005 2006) - Advised a coalition comprising all of the major electricity transmission network owners during the new Australian Energy Market Commission's review of the rules under which transmission prices are determined. Prepared advice on a number of issues and assisted the owners to draft their submissions to the AEMC's various papers.
- Advice on Energy Policy Reform Issues (Client: Victorian Department of Infrastructure/Primary Industries, 2003 ongoing) - advice to the Department regarding on issues relating to the transition to national energy market arrangements, cross ownership rules for the energy sector, the reform of the cost benefit test for electricity transmission investments and the scope for lighted handed regulation in gas transmission.
- Productivity Commission Review of the National Gas Code (Client: BHPBilliton, 2003 2004) - Produced two submissions to the review, with the important issues including the appropriate form of regulation for the monopoly gas transmission assets (including the role of incentive regulation), the requirement for ring fencing arrangements, and the presentation of evidence on the impact of regulation on the industry since the introduction of the Code.
- Development of the National Third Party Access Code for Natural Gas Pipeline Systems Code (Client: commenced while a Commonwealth Public Servant, after 1996 the Commonwealth Government, 1994-1997) - Was involved in the development of the new legal framework for the economic regulation of gas transmission and distribution systems, with advice spanning the overall form of regulation to apply to the infrastructure and the appropriate pricing principles (including the valuation of assets for regulatory purposes and the use of incentive regulation), ring fencing arrangements between monopoly and potentially contestable activities, and whether upstream infrastructure should be included within the regime.

Licencing / Franchise Bidding

- Competitive Tender for Gas Distribution and Retail in Tasmania (Client: the Office of the Tasmanian Energy Regulator, 2001 2002) - Economic adviser to the Office during its oversight of the use of a competitive tender process to select a gas distributor/retailer for Tasmania, and simultaneously to set the regulated charges for an initial period.
- Issuing of a Licence for Powercor Australia to Distribute Electricity in the Docklands (Client: the Office of the Regulator General, Vic, 1999) - Economic adviser to the Office during its assessment of whether a second distribution licence should be awarded for electricity distribution in the Docklands area (a distribution licence for the area was already held by CitiPower, and at that time, no area in the state had multiple licensees). The main issue concerned the scope for using

'competition for the market' to discipline the price and service offerings for an activity that would be a monopoly once the assets were installed.

Assessments of the degree and prospects for competition / need for regulation

- Transmission connection assets (Client: Grid Australia, 2012) – prepared an assessment of the degree of competition in the provision of transmission connection assets, which included advice on the market within which the service is provided and an assessment of the degree of rivalry (including the prospects for entry) in that market.
- South East network (Client: Kimberley Clarke, 2011) – advised whether the gas pipeline from which it is supplied would pass the threshold for regulation.
- Pilbara rail access (Client: BHP Billiton) – assisted in the preparation of expert evidence on whether the Pilbara rail infrastructure passed the test for declaration of essential infrastructure, with specific focus on the analysis of whether there would be a promotion of competition in other markets from the granting of access.
- Need for regulation of gas transmission pipelines (Client: SA Government) – advised as to whether the Moomba to Adelaide pipeline was likely to pass the threshold required for regulation under the Gas Code, focussing upon an assessment of the degree of competition for its services.

B. Pricing in non-infrastructure markets

Assessment of competition in energy retail markets

- Assessment of retail competition in Victoria and South Australia (Client: Australian Energy Market Commission) – assisted the Commission to quantity and interpret information on margins for retailers and to draw inferences about the level of competition. Also provided a peer review of the Commission's overall assessment of the level of competition, including the Commission's overall analytical framework and the other indicators it considered.

Default/transitional regulated prices for retail functions

- ACT transitional tariff review (Client: ICRC, ACT, 2010) – advised the regulator on an appropriate method to derive a benchmark wholesale electricity purchase cost for an electricity retailer, including the relationship between the wholesale cost and hedging strategy.
- South Australian default gas retail price review (Client: the Essential Services Commission, SA, (2007-2008) – derived estimates of the benchmark operating costs for a gas retailer and the margin that should be allowed. This latter exercise included a bottom-up estimate of the financing costs incurred by a gas retail business.
- South Australian default electricity retail price review (Client: the Essential Services Commission, SA, 2007) - estimated the wholesale electricity purchase cost for the default electricity retail supplier in South Australia. The project involved the development of a model for deriving an optimal portfolio of hedging contracts for a prudent and efficient retailer, and the estimate of the expected cost incurred with that portfolio.
- South Australian default gas retail price review (Client: the Essential Services Commission, SA, 2005) - As part of a team, advised the regulator on the cost of purchasing gas transmission services for a prudent and efficient SA gas retailer, where the transmission options included the use of the Moomba Adelaide Pipeline and SEAGas Pipeline, connecting a number of gas production sources.

Market Design

- Options for the Development of the Australian Gas Wholesale Market (Client: the Ministerial Committee on Energy, 2005) - As part of a team, assessed the relative merits of various options for enhancing the operation of the Australian gas wholesale markets, including by further dissemination of information (through the creation of bulletin boards) and the management of retailer imbalances and creation of price transparency (by creating short term trading markets for gas).
- Review of the Victorian Gas Market (Client: the Australian Gas Users Group, 2000 2001) - As part of a team, reviewed the merits (or otherwise) of the Victorian gas market. The main issues of contention included the costs associated with operating a centralised market compared to the potential benefits, and the potential long term cost associated with having a non-commercial system operator.
- Development of the Market and System Operation Rules for the Victorian Gas Market (Client: Gas and Fuel Corporation, 1960) - Assisted with the design of the 'market rules' for the Victorian gas market. The objective of the market rules was to create a spot market for trading in gas during a particular day, and to use that market to facilitate the efficient operation of the system.

Transfer pricing

- Application of a netback calculation for infrastructure under the Minerals Resource Rent Tax (Client: BHPB, 2011-13) – advised on how the arms-length price for the use of downstream infrastructure should be determined, including the valuation of assets, weighted average cost of capital and on the implications for the price of incentive compatible contracts.

Pricing strategy

- Pricing for telephone directory services (Sensis, 2012) – as part of a team, advised on how margins could be maximised for the telephone directory business in the context of falling print advertising and a very competitive digital market, informed by the application of econometric techniques.
- Effectiveness of promotional strategies (Target, 2011-12) – as part of a team, applied econometric techniques to assess the effectiveness of Target's promotional strategies, with tools developed for management to improve profitability.
- Optimal pricing (Client: Coles, 2011-12) – applied econometric techniques to assist Coles to set relativities of prices within "like" products and developed a method to test the effectiveness of promotional strategies.

C. Regulatory due diligence and other finance work

- Sale of the Sydney Desalination Plant (Client: a consortium of investors, 2011-12) – Prepared a regulatory due diligence report for potential acquirer of the asset, including a review of the financial modelling of future pricing decisions.
- Sale of the Abbot Point Coal Terminal port (Client: a consortium of investors / debt providers, 2010-11) – Prepared a regulatory due diligence report for potential acquirer of the asset, including a review of the financial modelling of future pricing decisions.
- Private Port Development (Client: Major Australian Bank, 2008) - Prepared a report on the relative merits of different governance and financing arrangements for a proposed major port development that would serve multiple port users.

- Sale of Allgas gas distribution network (Client: confidential, 2006) – Prepared a regulatory due diligence report for potential acquirer of the asset.
- Review of Capital Structure (Client: major Victorian water entity, 2003) - Prepared a report (for the Board) advising on the optimal capital structure for a particular Victorian water entity, taking account of the likely impact of cost based regulation.

D. Expert Witness Roles

- Abbot Point Coal Terminal Pricing Arbitration (Client: Adani, 2013) – Prepared a number of expert reports for the arbitration on economic issues arising from the application of the cost-based formula in the pricing agreement, including the economic meaning of key terms, the valuation of assets (and specifically the role and calculation of interest during construction), the quantification of transaction costs of raising finance and the calculation of the required rate of return (most notably, the benchmark cost of debt finance).
- New Zealand Input Methodologies (Clients: Powerco and Christchurch International Airport Limited, 2009-2012) – Prepared expert report for both clients on a range of economic issues, including the valuation of assets, weighted average cost of capital, cost allocation, the regulatory treatment of taxation and interpretation of the new purpose statement in the Commerce Act. Appeared as an expert before the Commerce Commission in the key conferences held during the review. Also assisted the clients in their subsequent merit reviews of the Commission's decision.
- Victorian gas market dispute resolution panel (Client: VENCorp, 2008) – Prepared a report and was cross examined in relation to the operation of the Victorian gas market in the presence of supply outages.
- Consultation on Major Airport Capital Expenditure Judicial Review (Client: Christchurch International Airport, 2008) - Prepared an affidavit for a judicial review on whether the airport consulted appropriately on its proposed terminal development. Addressed the rationale, from the point of view of economics, of separating the decision of 'what to build' from the question of 'how to price' in relation to new infrastructure.
- New Zealand Commerce Commission Draft Decision on Gas Distribution Charges (Client: Powerco, 2007 08) - Prepared an expert statement about the valuation of assets for regulatory purposes, with a focus on the treatment of revaluation gains, and a memorandum about the treatment of taxation for regulatory purposes and appeared before the Commerce Commission.
- Sydney Airport Domestic Landing Change Arbitration (Client: Virgin Blue, 2007) - Prepared two expert reports on the economic issues associated with the structure of landing charges (note: the evidence was filed, but the parties reached agreement before the case was heard).
- New Zealand Commerce Commission Gas Price Control Decision – Judicial Review to the High Court (Client: Powerco, 2006) - Provided four affidavits on the regulatory economic issues associated with the calculation of the allowance for taxation for a regulatory purpose, addressing in particular the need for consistency in assumptions across different regulatory calculations.
- Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Service Incentive Risk (Client: the Essential Services Commission, Vic, 2005 2006) - Prepared expert evidence on the workings of the ESC's service incentive scheme and the question of whether the scheme was likely to deliver a windfall gain or loss to the distributors (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).
- Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Price Rebalancing (Client: the Essential Services Commission, Vic, 2005 2006) - Prepared expert

evidence on the workings of the ESC's tariff basket form of price control, with a particular focus on the ability of the electricity distributors to rebalance prices and the financial effect of the introduction of 'time of use' prices in this context (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).

- New Zealand Commerce Commission Review of Information Provision and Asset Valuation (Client: Powerco New Zealand, 2005) - Appeared before the Commerce Commission for Powerco New Zealand on several matters related to the appropriate measurement of profit for regulatory purposes related to its electricity distribution business, most notably the treatment of taxation in the context of an incentive regulation regime.
- Duke Gas Pipeline (Qld) Access Arrangement Review – Appeal to the Australian Competition Tribunal (Client: the Australia Competition and Consumer Commission, 2002) - Prepared expert evidence on the question of whether concerns of economic efficiency are relevant to the non price terms and conditions of access (note: the evidence was not filed as the appellant withdrew its evidence prior to the case being heard).
- Victorian Electricity Distribution Price Review – Appeal to the ORG Appeal Panel: Rural Risk (Client: the Office of the Regulator General, Vic, 2000) - Provided expert evidence (written and oral) to the ORG Appeal Panel on the question of whether the distribution of electricity in the predominantly rural areas carried greater risk than the distribution of electricity in the predominantly urban areas.
- Victorian Electricity Distribution Price Review – Appeal to the ORG Appeal Panel: Inflation Risk (Client: the Office of the Regulator General, Vic, 2000) - Provided expert evidence (written and oral) to the ORG Appeal Panel on the implications of inflation risk for the cost of capital associated with the distribution activities.

Qualifications and memberships

- Bachelor Economics (First Class Honours) University of Adelaide
- CEDA National Prize for Economic Development

C. Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia

FEDERAL COURT OF AUSTRALIA
Practice Note CM 7
EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

Practice Note CM 7 issued on 1 August 2011 is revoked with effect from midnight on 3 June 2013 and the following Practice Note is substituted.

Commencement

1. This Practice Note commences on 4 June 2013.

Introduction

2. Rule 23.12 of the Federal Court Rules 2011 requires a party to give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).

3. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence[1], and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court[2]

1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.

1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential.

1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

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[1] As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].

[2] The "*Ikarian Reefer*" (1993) 20 FSR 563 at 565-566.

2. The Form of the Expert's Report[3]

2.1 An expert's written report must comply with Rule 23.13 and therefore must

(a) be signed by the expert who prepared the report; and

(b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and

(c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and

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

(e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and

(f) set out separately from the factual findings or assumptions each of the expert's opinions; and

(g) set out the reasons for each of the expert's opinions; and

(ga) contain an acknowledgment that the expert's opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (c) above[4]; and

(h) comply with the Practice Note.

2.2 At the end of the report the expert should declare that "[the expert] has *made all the inquiries that* [the expert] *believes are desirable and appropriate and that no matters of significance that* [the expert] *regards as relevant have, to* [the expert's] *knowledge, been withheld from the Court*."

2.3 There should be included in or attached to the report the documents and other materials that the expert has been instructed to consider.

2.4 If, after exchange of reports or at any other stage, an expert witness changes the expert's opinion, having read another expert's report or for any other reason, the change should be communicated as soon as practicable (through the party's lawyers) to each party to whom the expert witness's report has been provided and, when appropriate, to the Court[5].

2.5 If an expert's opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report.

2.6 The expert should make it clear if a particular question or issue falls outside the relevant field of expertise.

2.7 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports[6].

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[3] Rule 23.13.

[4] See also *Dasreef Pty Limited v Nawaf Hawchar* [2011] HCA 21.

[5] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565

[6] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565-566. See also Ormrod *"Scientific Evidence in Court"* [1968] Crim LR 240

3. Experts' Conference

3.1 If experts retained by the parties meet at the direction of the Court, it would be improper for an expert to be given, or to accept, instructions not to reach agreement. If, at a meeting directed by the Court, the experts cannot reach agreement about matters of expert opinion, they should specify their reasons for being unable to do so.

J L B ALLSOP
Chief Justice
4 June 2013