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Dear Mark

S factor close out

Introduction and summary of conclusions

The brief

You have asked PricewaterhouseCoopers to review whether the Australian Energy Regulator's (AER) draft decision for the Victorian electricity distribution businesses is consistent with the operation of the Essential Services Commission of Victoria (ESCV) S factor scheme.

Background

The AER foreshadowed in its framework and approach paper that it proposed to discontinue the former ESCV S factor scheme after the end of the current regulatory period (the 2011-2015 regulatory period) and replace it with a new service incentive scheme (the 'STPIS'). The mechanics of the two S factor schemes differ.

- Under the ESCV scheme, any incremental change in service performance in one year compared to the previous is rewarded (or penalised) through a change to the level of average prices that remains in place for 6 years.
- Under the AER scheme, performance in any year is compared to a target for that year, and any difference between the forecast and outturn performance is rewarded or penalised by a change to prices in a single year. However, a sustained change in performance will lead to a sustained reward or penalty until the targets are reset, creating a comparability to the ESCV scheme.

The structure of the ESCV's scheme means that, if the scheme had continued, performance over the 2006-2010 regulatory period would have led to an adjustment to prices for the following five-year regulatory period and then into the following regulatory period. As part of discontinuing the ESCV scheme, the AER proposed to add the future

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increments or decrements to distribution business revenue that would have occurred as a result of service performance in the 2006-2010 regulatory period to the distribution businesses revenue requirements for the 2011-2015 regulatory period.

Findings and conclusions

I have reviewed the financial model that the AER provided to the Victorian distribution businesses to estimate the future increments or decrements to distribution business revenue that would have occurred as a result of service performance in the 2006-2010 regulatory period.

In my view, the AER has <u>not</u> correctly quantified the value of the future increment or decrement to revenue for performance in 2010 that would have resulted from a continuation of the ESCV scheme.

An important aspect of the design of the S factor scheme was to cater for the random volatility in annual service performance arising from the effects of weather events on measured reliability. An assumption when designing the scheme was that there would be 'randomly-bad' and possibly 'randomly-good' years around an underlying level of service performance. This volatility was catered for within the S factor scheme in two ways.

• Within the regulatory period, the S factor increments and decrements were based upon the change in performance from one year to the next. This means that if there was a randomly bad year, a decrement to revenue would be created in respect of that year and borne for the next 6 years. However, if performance had indeed been 'randomly bad' then performance in the next year would be expected to improve relative to the year before, and an increment to revenue would be created and received for the following 6 years. The negative and positive amounts would approximately cancel out in all except the first (a negative) and seventh (a positive) years after the randomly bad year.¹

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This 'cancelling out' was very close, but not perfect. If a particular one-off (adverse) event gave rise to an S factor of -2 per cent in one year and was not repeated in the next, then the aggregate effect on the average price level of the negative event followed by the absence of the negative event would be equal to: (1-2%)x(1+2%) = 99.96% (or prices would be 0.04% lower than otherwise as a result of the event). Also note that under this scheme the distribution business would experience volatility in annual cash flow (that is, cash flow would fall in one year and then rise in the next, with the opposite effect in six years time), which would also translate into an equivalent volatility in prices. The ESCV introduced the ability for an S factor to be 'banked' from one year to the next as a means of



• At the juncture of one regulatory period and the next, the same payoffs were created by continuing to calculate the S factor increments and decrements based upon the change in performance from one year to the next, including between the final year of one regulatory period and the first year of the next regulatory period. Thus, if performance was randomly bad in the last year of the one regulatory period and returned to the underlying level in the following year, then the scheme would have generated a decrement in the last year of the regulatory period and an offsetting increment in the next, which (absent changes to the scheme) would cancel out in all except the first and seventh years, as described earlier.

Thus, if the ESCV scheme had continued, the payoff for service performance in 2010 would have comprised two components, namely:

- the decrement or increment in respect of 2010 performance; and
- to the extent that 2010 performance was 'randomly bad' or 'randomly good', an offsetting decrement or increment in the following year as performance returned to the underlying level.

However, the combination of the AER's method for quantifying the value of the future increment or decrement to revenue for performance in 2010 together with its approach for setting the new performance targets means that only the first of these components has been taken into accounted. This implies that:

- if 2010 turns out to be a 'randomly bad' year, then the penalty for 2010 performance will be much larger than intended under the ESCV scheme; whereas
- if 2010 turns out to be a 'randomly good year', then the reward for 2010 performance will be much larger than intended under the ESCV scheme.

Importantly, the treatment of 2010 performance would also be much more adverse (if 2010 is 'randomly bad') or favourable (if 2010 turns out to be 'randomly good') than if the AER scheme had applied previously and continued to apply.

There are several approaches that could be adopted to remedy this error and restore the treatment of 2010 performance to something that would be more consistent with the former ESCV scheme and with the new AER scheme.

reducing this annual volatility without changing the value associated with the relevant increments and decrements.



- One remedy would be to set the new performance targets under the AER scheme at
 the level of outturn performance in 2010 (while this would not be known until after the
 end of 2010, it will not be required until after that time either). This would create
 approximately the same payoffs in respect of 2010 performance as would have
 occurred under a continuation of the ESCV scheme (a correction would be required to
 replicate the ESCV payoffs exactly).
- A <u>second remedy</u> would be to reapply the ESCV scheme again for 2011 on the
 assumption that performance in 2011 returns to the new target. The AER scheme
 would then be applied simultaneously to reward or penalise any difference between
 the new target performance and the actual level.
- At first sight, a third remedy would appear to be to apply the penalty or reward in respect of 2010 performance that would be calculated under the ESCV scheme for a single year rather than applying it for the six years that would be the case under the ESCV scheme. However, this remedy is only approximately correct if performance in 2009 was at the underlying level, which cannot be assumed (and, for Powercor, I understand this clearly was not the case).

Out of these, I would advocate the <u>second remedy</u> as it most closely replicates the payoffs that would have occurred under the ESCV scheme, is computationally the simplest and avoids having to change the performance targets from those already foreshadowed for the 2011-2015 regulatory period.

I note that the potential windfall loss or gain arising from the shortcoming identified above is very material. The annual volatility in service performance has translated into changes in the annual S factor of several percentage points or more. If 2010 is a 'randomly bad' year and the S factor attributable to that year is in the range of several percentage points, then the aggregate loss would be in the order of 15 per cent of annual revenue (or more than \$60 million in Powercor's case alone).

I note for completeness that, with the exception of the important omission that was discussed above, I agree with the AER's quantification of the value of the future increments or decrements to distribution business revenue that would have occurred as a result of service performance in the 2006-2010 regulatory period.

Structure this report

I expand upon these comments in the discussion below and illustrate the comments with simple numerical examples.



Declaration and qualifications

I have read the Federal Court guidelines for the conduct of expert witnesses and agree to be bound by those guidelines.

I have over 17 years of experience in infrastructure regulation matters across a wide range of industries, first in the Australian public service, then for 13 years with the Allen Consulting Group (an Australian economic consultancy) and for the last year as an Executive Director in the economics practice of the Australian firm of PricewaterhouseCoopers. I have worked for almost every economic regulator in Australia and also have as clients a number of large consumers of energy and utility services as well as and infrastructure owners. My work on infrastructure regulation has spanned a number of industries, including gas, electricity, water, ports and rail. A key focus of this work has been on applying finance theory and practice to the context of regulation. My full curriculum vita was attached to the reports prepared in this proceeding.

Specifically in relation to the S factor, I was part of the team who assisted the Office of the Regulator-General (as it was then) design the S factor in the 2001 electricity distribution price review, assisted the ESCV in its refinement of the scheme in the 2006 electricity distribution price review and acted as an expert witness for the ESCV when aspects of the scheme were appealed after that review (the matter was withdrawn prior to being heard).

Elaboration of comments

The discussion below elaborates upon the comments above by demonstrating how the ESCV and AER schemes and the transitional arrangements would operate for a very simple example. The shortcomings in the transitional measures are identified and the remedies discussed above are then illustrated.

The following simplifying assumptions are adopted in the figures below in order to promote the ease of exposition.

- The values for the 'target' and 'actual' level of service performance are an illustrative proxy for an overall measure service performance, where an increase in the value indicates a decline in service performance (for example, per customer minutes off supply or SAIDI).
- The proxy service indicator discussed above have been selected/calibrated so that a
 unit change in the aggregate level of service performance would translate into \$1 of
 reward or benefit under the ESC or AER schemes.



- The underlying (and average) level of service performance over 2005-2009 is 100 units, and hence the target level of performance under the AER scheme for 2011-2015 is 100 units. I have ignored in this analysis how the method for setting the targets for 2016-2020 may affect the findings, but comment on possible implications separately for completeness.
- The target under the ESCV scheme for 2006-2010 was 120 and constant, reflecting the target at the end of the previous regulatory period (2005). It is also assumed that the target would be retained at 120 if the scheme operated in the 2011-2015 and 2016-2020 regulatory periods. However, as noted above:
 - the level of the target under the ESCV scheme is irrelevant given that rewards or penalties are based upon incremental service improvement or decline; and
 - continuing the target at the previous level and continuing the scheme from one regulatory period to the next is mathematically equivalent to recommencing the ESCV scheme in each new regulatory period and setting the target at the level of performance in the year before.
- Performance is equal to the underlying (and average) level of performance in all years except 2010. This assumption is made in order to isolate the effect of random service performance events in 2010.
- I have also assumed that a one-unit change in service performance results in the same revenue outcome in all three regulatory periods (2006-2010, 2011-2015 and 2016-2020). I am aware that this is incorrect because the AER has proposed to increase the incentive rates for the next regulatory period from previous levels. I explain the implications of this matter below.

In addition, all of the figures record increments or decrements to revenue against the year to which the increment or decrement would be attributable. In practice, as performance levels are not known until after the year in question, the increment or decrement is earned or suffered in the second year after the year to which the performance relates. This time lag does not change the analysis of the schemes, however.

If the target is retained at the same level then consistency requires that the level of expenditure that is factored into prices be such that the current underlying level of service continues into the future. If the capital expenditure forecasts factor in service improvements, or alternatively provide less expenditure than is required to maintain current standards, then a trend increase or decrease in service performance should be factored in.



I first describe the implications of a 'randomly bad' 2010 under both the ESCV and AER schemes, and then the implications of the transition between the schemes as per the AER Draft Decision in relation to the Victorian electricity distributors. I find that the AER's proposed method for addressing the transition would treat any one-off aspect of 2010 performance in an unintended and inappropriate manner, and suggest several refinements that would address this shortcoming.

The ESCV and AER schemes and a 'randomly bad' 20103

Figure 1 first illustrates how the ESCV scheme would have reacted to 'randomly bad' performance in 2010.

FIGURE 1 - ESCV SCHEME AND 'RANDOMLY BAD' 2010

	Regulat	ory period	1		Regula	tory period	12		Regulatory period		
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	•••
Target	120	120	120	120	120	120	120	120			
Actual	100	100	150	100	100	100	100	100			
ESC penalty / reward 2010			-50	-50	-50	-50	-50	-50			
ESC penalty / reward 2011				50	50	50	50	50	50		
Penalty / reward total			-50	0	0	0	0	0	50		

The points to note from this example are that:

- The 'randomly bad' performance translates into a decrement in revenue that will be held for six years (in practice, the decrement would have been suffered from 2012 to 2017).
- The return to average or underlying level of performance in the following year is treated as an incremental gain and thus gives rise to an increment to revenue for six years.
- The decrement and increment referred to above would cancel out in all except the first and last years, and so the simple sum of the payoffs over time is zero (as illustrated).
 The total economic loss suffered from the poor 2010 performance would be the difference in the present values of the one-off decrement and increment to revenue.

I note for completeness that the discussion in this section applies equally to randomly bad and randomly good performance in 2010, and that the remedies proposed should apply symmetrically.



Figure 2 demonstrates how the AER scheme would deal with the equivalent situation if the AER's scheme had operated in the 2006-2010 regulatory period (it is assumed that the AER's target would have been 100 units for the period, reflecting the underlying level of performance at the start of that period).

FIGURE 2 - AER SCHEME AND 'RANDOMLY BAD' 2010

	Regulat	ory period	1		Regula		Regulatory period 3				
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Target	100	100	100	100	100	100	100	100			
Actual	100	100	150	100	100	100	100	100			
AER penalty / reward				0	0	0	0	0			
Penalty / reward total			-50	0	0	0	0	0			

The points to note from this example are that:

- The 'randomly bad' performance translates into a one-off decrement in revenue attributable to 2010 (in practice, the decrement would have been suffered in 2012).
- As performance is assumed to return to the average or underlying level of performance thereafter,⁴ there are no increments or decrements to revenue attributable to the remainder of the 2011-2015 regulatory period.

Thus, under the AER scheme under the assumptions set out above, randomly bad performance in the last year of a regulatory period would receive that penalty for a year and so receive a greater penalty than under the ESC scheme. Importantly, that penalty would be borne for one year only.

Figure 3 now demonstrates the payoffs that result from the transition between the ESCV scheme and the AER scheme. The quantification assumes that the AER's method set out in the Draft Decision is applied for estimating the future increments or decrements to distribution business revenue that would have occurred under the ESCV scheme as a result of service performance in the 2006-2010 regulatory period.

FIGURE 3 - TRANSITION BETWEEN ESCV SCHEME AND AER SCHEME AND 'RANDOMLY BAD' 2010

As noted above, this is not a necessary assumption, it is merely made to isolate the effect of randomly bad performance in 2010.



	Regulatory period 1			Regulatory period 2			Regula	tory perio	od 3		
	2008	2009	2011	2012	2013	2014	2015	2016	2017		
Target	120	120	120	100	100	100	100	100			
Actual	100	100	150	100	100	100	100	100			
ESC penalty / reward 2010			-50	-50	-50	-50	-50	-50			
AER penalty / reward				0	0	0	0	0			
Penalty / reward total			-50	-50	-50	-50	-50	-50			

The points to note from this example are that:

- The 'randomly bad' performance would translate into a decrement in revenue that is held for six years, as it would have under the ESCV scheme. However, unlike under the ESCV scheme, there is no corresponding increment to revenue as performance reverts to the underlying level that is held for the following six years.
- The return of performance to the underlying (and target) level in 2016 generates no reward or penalty, which is consistent with the intended operation of the new AER scheme. However, the fact that the one-off poor performance in 2010 translates into 6 years of decrements rather than a single year decrement is not consistent with the AER scheme.

Thus, the penalty for this randomly bad year thus is much higher than would have been the case under either the ESCV or under the AER scheme if it had operated previously and continued to apply.

Proposed Remedies

I describe and illustrate two corrections to the AER's proposed method for managing the transition between the schemes that are designed to address the matters above (which I refer to as 'remedies'). I also describe a third apparent remedy that, on further analysis, proves not to be robust to realistic conditions. To be clear, the design objective is to restore the payoff for a 'randomly bad' or 'randomly good' outcome for reliability in 2010 to one that is consistent with what would have happened if the ESCV scheme had it continued. These remedies are as follows:

- Remedy 1 set the new performance targets under the AER scheme at the level of outturn performance in 2010.
- Remedy 2 reapply the ESCV scheme again for 2011 on the assumption that performance in 2011 returns to the new target. The AER scheme would apply



simultaneously and appropriately reward or penalise any difference between the new target performance and the actual level.

The third apparent remedy is to only apply the penalty or reward in respect of 2010 performance that would be calculated under the ESCV scheme for a single year rather than applying it for the six years that would be the case under the ESCV scheme.

The operation of the first two remedies is illustrated in figures 4 to 5 below. All of these figures assumes a 'randomly bad' 2010 and then a return to underlying service performance from 2011 onwards, consistent with the examples provided in figures 1 to 3.

FIGURE 4 - TRANSITION BETWEEN ESCV SCHEME AND AER SCHEME - REMEDY 1

	Regulatory period 1				Regula	tory period		Regulatory period 3				
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
Target	120	120	120	150	150	150	150	150				
Actual	100	100	150	100	100	100	100	100				
ESC penalty / reward 2010			-50	-50	-50	-50	-50	-50				
AER penalty / reward				50	50	50	50	50				
Penalty / reward total			-50	0	0	0	0	0				

Under Remedy 1 the service performance target for 2011-2015 is higher (more permissive) than otherwise, which generates a benefit under the AER scheme that approximately mirrors the second component (i.e., the benefit when performance reverts back to the average in 2011) of the ESCV scheme. It is noted, however, that this remedy falls short of properly replicating the payoffs that would have resulted under the ESCV's scheme – replicating the payoffs exactly (but subject to the qualification below) would require the benefit attributable to the difference between the underlying level of performance (the current targets) and the higher targets to be continued for one year further.

Under Remedy 2 the ESCV scheme is applied to capture the benefit that would have arisen from a reversion to underlying performance in 2011.⁵ As would be expected, the

The values that are described as the target performance for 2011 to 2015 are the targets that would be set under the AER scheme. If the ESCV scheme had continued, the target (implicitly) would have continued at 120 units. As discussed above, by continuing the targets at the previous level merely implies that the reward or penalty is based upon the change in performance from one year to the next. Accordingly, the calculations for the reward or penalty under the ESCV scheme for 2011 assume that the old target of 120 units continued or that there was no explicit target under the ESCV scheme.



payoffs match precisely what would have occurred if the ESCV scheme had continued unchanged.

FIGURE 5 – TRANSITION BETWEEN ESCV SCHEME AND AER SCHEME – REMEDY 2

	Regulatory period 1				Regula	tory period		Regulatory period 3			
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Target	120	120	120	100	100	100	100	100			
Actual	100	100	150	100	100	100	100	100			
ESC penalty / reward 2010			-50	-50	-50	-50	-50	-50			
ESC penalty / reward 2011				50	50	50	50	50	50		
AER penalty / reward				0	0	0	0	0			
Penalty / reward total			-50	0	0	0	0	0	50		

Figure 6 now shows the apparent but incorrect remedy, namely to apply the decrement to revenue in respect of 2010 performance is applied for only 1 year when calculating the 'close out amount' (that is, the remaining financial effect of the ESCV scheme after the end of the 2006-2010 regulatory period).

FIGURE 6 - TRANSITION BETWEEN ESCV SCHEME AND AER SCHEME - DISCARDED REMEDY

	Regulat	ory period	1	Regulatory period 2 Regulatory					Regula	ılatory period 3		
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
Target	120	120	120	100	100	100	100	100				
Actual	100	100	150	100	100	100	100	100				
ESC penalty / reward 2010			-50	0	0	0	0	0				
AER penalty / reward				0	0	0	0	0				
Penalty / reward total			-50	0	0	0	0	0				

While this apparent remedy delivers a result that is the same as that produced by Remedy 1, it only produces the correct result under the restrictive assumption that performance in 2009 was a normal year. However, if performance in 2009 was also different to the underlying level of performance, then the decrement or increment under the ESCV scheme in respect of 2010 would not reflect the difference between actual and underlying performance for 2010. The possibilities include that:

- if 2009 performance was worse than the underlying performance but better than 2010, then Remedy 3 would under-compensate the electricity distribution business for the error in the transitional arrangements described above;
- if 2009 performance was worse than the underlying performance and worse than 2010 (so that 2010 was an incremental improvement), then the correction that is implied by



Remedy 3 would be in the wrong direction – that is, the distribution business would be worse off than if the remedy was not implemented; and

• if 2009 performance was better than the underlying performance, then remedy 3 would overcompensate the electricity distribution business for the error in the transitional arrangements described above.

In contrast, remedies 1 and 2 are robust to whether or not the decrement or increment in respect of 2010 reflects the difference between actual and underlying performance for 2010.

Of the two remedies, the <u>second</u> is the most practicable for the following reasons.

- First, the first remedy would require a revision to the targets that are set for the 2011-2015 regulatory period, which would be a major change to the expected arrangements. The fact that the AER has changed the criteria for defining unusual events (which are excluded from the target and measured performance) would also make this remedy complex to apply.
- Secondly, remedy 1 would imply that the new service incentive scheme would apply to generate the reward (or penalty) from the return to the underlying level of performance in 2011 and, relevantly, the AER has increased the strength of the incentive rates for the 2011-2015 regulatory period. Applying the new incentive rates to value the return to underlying performance could be interpreted as leaving open the scope for a windfall gain or loss.⁶

As the objective defined above was to produce the outcomes that would have been delivered under the ESCV scheme, whether or not the potential for a windfall gain or loss was considered to arise would depend upon whether the incentive rates would have been changed if the old scheme had continued. Given that the ESCV set the incentives rates for the 2006-2010 regulatory period as the best estimate at the time of the customer willingness to pay for reliability (or value of customer reliability), it could be argued that the incentive rates under the old scheme also would have been increased in line with the new market evidence and applied to derive the 2011 performance benefit.

During the last review, the ESCV considered the issue of whether the change in incentive rates from one regulatory period to the next warranted specific measures to address random events in the last year of the regulatory period. It decided not to make such an adjustment, largely because of the difficulty of identifying a normal level of service performance, which is a position that I supported. I note, however, that the same concerns do not arise in the current matter. In particular, the change is not merely a change to



• Thirdly, remedy 2 provides the closer fit to the payoffs that would have resulted from the ESCV scheme (and, as discussed above, remedy 1 would require an adjustment).

As noted above, the AER has changed the changed the criteria for defining unusual events (which are excluded from the target and measured performance), which needs to be taken into account when applying remedy 1. In particular, given that the objective of the remedy discussed above is to offset any one-off factors that were present in the penalty or reward for 2010 performance, it is important for the remedy to use the same measure of performance – including the exclusion criteria – as applied to 2010 performance. However, this would also require an estimate of what the new performance targets would have been if the old exclusion criteria had continued to apply.

I noted above that I have ignored any effect on this analysis of how the AER may set the new targets for the 2016-2020 regulatory period, reflecting the fact that the AER has not signalled how it intends to reset the performance targets in the future. Some observations on the possible implications of different methods are as follows.

- The AER may use statistical methods to derive an unbiased forecast of underlying or future performance from 2016 onwards. In this circumstance, there would be no reason to expect that year 2010 performance would have a direct effect on future rewards or penalties for service performance and so the analysis that is presented above would be unaffected.
- The AER may set the targets for 2016 onwards at an average of historical performance. To the extent that this average includes 2010, then below average performance in 2010 may result in higher future performance targets than otherwise and so a resulting future benefit that, if the AER made a binding commitment as to how it would set the new targets, would be appropriate to take into account. That said, whether a benefit would be created would depend upon whether the unusual performance in 2010 arose from events that would not be excluded under the new exclusion criteria. In addition, as well as being uncertain this potential offsetting benefit would be small in value and, even under the most optimistic assumptions, would not come close to remedying the problems with the transition to the new service scheme that have been described above.

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incentive rates but to the design of the scheme, a consequence of which is that the AER has had to identify the underlying level of service.



S factor close out – AER Draft Decision 6 August 2010
Yours sincerely,
Jeff Balchin Executive Director Advisory
PricewaterhouseCoopers is committed to providing our clients with the very best service. We would appreciate your feedback or suggestions for improvement. You can provide this feedback by talking to your engagement partner, calling us within Australia on 1300 792 111 or visiting our website http://www.pwcfeedback.com.au/