Appendix: Closing out the ESCV S-Factor Scheme

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Revision Log

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1. APPLICATION OF INCENTIVE MECHANISMS

1.1 The existing (or old) service target incentive system

The then Office of the Regulator-General (ORG) introduced a financial incentive scheme by the addition of an S-factor into the price control formula from 2001. The objective of the scheme was to encourage electricity distributors to meet or exceed the targets set for unplanned CAIDI (Customer Average Interruption Duration Index), unplanned SAIFI (System Average Interruption Frequency Index), and planned SAIDI (System Average Interruption Duration Index). The S-factor rewards distributors with additional revenue through higher average prices where actual performance improves relative to the reliability targets, and penalises them with lower revenue through lower average prices where actual performance deteriorates relative to the reliability targets.

Under the existing scheme, the S-factor reward or penalty is calculated as a function of the change in the performance 'gap' from year (t-3) to year (t-2), where the gap is measured as the absolute difference between the target performance for a particular variable, and the reported performance.

In 2005, the Essential Services Commission, Victoria (ESCV), sought to refine the S-factor system in light of stakeholder comments and experience over the first few years of the scheme. The ESCV incorporated a range of new measures into the S-factor for the 2008 to 2012 period, based on the performance recorded from 2006 to 2010. The variables chosen were as follows:

- Unplanned minutes off-supply (unplanned SAIDI);

- Sustained supply interruptions (unplanned SAIFI);

- A momentary supply interruption measure (MAIFI); and

- A call centre performance variable (the proportion of calls answered by an operator within 30 seconds).

New network weightings and incentive rates were also calculated and published, with the intention that these would take effect from 2008 (based on performance from 2006).

The ESCV determined that the S-factor to be calculated in 2006 and 2007, would be based on performance during 2004 and 2005, and would draw upon the original set of variables that was specified in the Price Controls dated September 2000.

1.1.1 Summary of incentive rates and variables under the current S-factor scheme

The variables and incentive rates which comprise the current S-factor scheme, and the time periods over which they are applicable, are summarised in Table 1-1.

The withdrawal of planned SAIDI occurred after UED and other distributors raised concerns with the ESCV about the potential safety implications of live line work. UED noted that there was a conflict between safe work practices and the incentives engendered by an explicit target for planned minutes off supply. UED also submitted that the increased work programme associated with its capital expenditure proposal would necessitate more planned outages in order to accommodate the works. The ESCV acknowledged the

potential for safety incidents resulting from live line work, and conceded to the removal of planned SAIDI from the S-factor scheme.

Table 1-1:   Performance measures and incentive rates, current S-factor scheme

	Price control formula year		
Variable	**2003 to 2005**	**2006 to 2007**	**2008 to 2012**
Unplanned SAIFI	0.0276%	0.0324%	0.0515%
Momentary MAIFI	--	--	0.0043%
Unplanned CAIDI	0.0064%	0.0075%	--
Unplanned SAIDI	--	--	0.0037%
Planned SAIDI	0.0009%	0.0011%	--

Source: EDPR 2006 to 2010. Final Decision Volume I. Statement of Purpose and Reasons. The 'price control formula year' is the year in which the calculated S-factor affects tariffs.

1.2   Transitional issues arising out of the existing S-factor scheme

1.2.1   Problems with the current S-factor formula

Second order error

The existing S-factor formulation suffers from second round error, which means that a particularly good or bad performance in any one year is not correctly reset in the following year. The error is essentially second order in $S_t^{'}$ and is therefore only material for large deltas. The example below serves to illustrate that a particularly large S-factor in one year, resulting from a sudden deterioration in performance two years' earlier, has an impact on revenue which is never fully unwound.

For ease of exposition, we assume that performance targets are achieved for all indicator variables, other than for unplanned SAIDI. The distributor in question misses the target for SAIDI by a large margin in year two, but then reverts to normal baseline performance from year three onwards. In year two, unplanned SAIDI is reported as being 89 minutes, as compared to a target of 79 minutes. The annual revenue requirement is assumed to be $300 million in year one. The S-factor computation under the old regime is presented below in Table 1-2. For simplification, we assume that there is no banking of S-factor penalties, although one period banking is permitted under the scheme.

Table 1-2:   Second order error under the old S-factor regime, years 1 to 6

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
SAIDI - urban						
Target performance	87.0	79.0	73.0	66.0	59.0	59.0

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Actual performance	87.0	89.0	73.0	66.0	59.0	59.0
Incentive rate	0.0000	0.0000	0.0486	0.0486	0.0486	0.0486
Gap	0.0000	-10.0000	0.0000	0.0000	0.0000	0.0000
Raw S-factor (S double dash)	**0.000%**	**0.000%**	**0.000%**	**-0.486%**	**0.486%**	**0.000%**
Final S factor	1.000000	1.000000	1.000000	0.995142	1.004858	1.000000
S' t-6 (carry-forward)	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
X-factor	1.000%	1.000%	1.000%	1.000%	1.000%	14.700%
Raw PTRM revenue	$300.00	$297.00	$294.03	$291.09	$288.18	$245.82
Final revenue	$300.00	$297.00	$294.03	$289.68	$288.17	$245.81
$ reward/penalty	**$0.000**	**$0.000**	**$0.000**	**-$1.414**	**-$0.007**	**-$0.006**

Source: UED analysis. The example is for illustrative purposes, and does not represent actual outcomes.

The marked increase in the number of unplanned minutes off-supply in year two gives rise to a negative S-factor of -0.486% in year four. The penalty in terms of revenues is (negative) $1.414 million. In year five, the S-factor is reversed, giving a positive value of +0.486%, however this percentage is applied to the year four tariffs, which are already at a lower level. In this example, we assume that energy consumption via the distribution network is unchanged from year four to year five, and thus the year five S-factor can be applied to the final revenue for year four. The product of the year four revenue, the X-factor and the S-factor gives $289.68 × (1-0.01) × (1+0.00486) = $288.17 million. This dollar figure is marginally lower than the $288.18 million which would have been recorded in the absence of S-factor adjustments. Thus, the penalty in year five is $7,000 which is a direct consequence of the second order error.

The results from year seven to year twelve are presented below in Table 1-3. The impact of the performance shortfall in year two is manifested through the carry-over (or carry-forward) component, S_{t-6}, from year seven onwards. A regulatory reset has not been activated for the modelling scenario shown. Although the results would change if a reset were switched on, the principle of second order error would not be undermined. The results would still show revenue effects which are not fully reversed over the twelve-year period.

There is a continued revenue shortfall in years seven, eight and nine, as a result of the deficient reliability of service performance in year two. There is a positive revenue impact in year ten (six years after the first S-factor effect) as a result of the carry-forward.

The carry-forward is calculated as $-0.00486\big/\left(1-X_{0,S}\right)$, where $X_{0,S}$ is equal to 14.8%, as per the final determination of the EDPR, 2006 to 2010 (ESCV, 2005b). The S-factor for year ten is equal to the inverse of the carry-forward, yielding $\dfrac{1}{\left(1-0.00570\right)} = 1.005735$.

There are further ripple effects on revenue in year eleven and year twelve as a result of the second order error. The undiscounted sum of the rewards and penalties over the twelve year period gives -$0.171 million, equivalent to a net negative penalty of $171,000.

Table 1-3:   **Second order error under the old S-factor regime, years 7 to 12**

	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
SAIDI - urban						
Target performance	59.0	59.0	59.0	59.0	55.7	55.7
Actual performance	59.0	59.0	59.0	59.0	55.7	55.7
Incentive rate	0.0486	0.0889	0.0889	0.0889	0.1793	0.1793
Gap	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Raw S-factor (S double dash)	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
Final S factor	1.000000	1.000000	1.000000	1.005735	0.994330	1.000000
S' t-6 (carry-forward)	**0.000%**	**0.000%**	**0.000%**	**-0.570%**	**0.570%**	**0.000%**
X-factor	2.500%	2.500%	2.500%	2.500%	9.200%	2.500%
Raw PTRM revenue	$239.67	$233.68	$227.84	$222.14	$201.70	$196.66
Final revenue	$239.67	$233.67	$227.83	$223.41	$201.71	$196.66
$ reward/penalty	**-$0.006**	**-$0.006**	**-$0.005**	**$1.269**	**$0.002**	**$0.002**

Source: UED analysis. The example is for illustrative purposes, and does not represent actual outcomes.

Algebraic explanation of the second order effect

Suppose that a distributor experiences a "delta" performance, meaning that it out-performs in one year but then performs exactly to target in every other year. Essentially, therefore, the gap between the targeted level of performance and out-turn performance will be positive in one year and zero in every other year.

For the purposes of this explanation, we can ignore the lags between performance and financial reward, and we will also set aside considerations of banking.

$$S_t^{'} = GAP_t - GAP_{t-1}$$

For the distributor in question, $S_t^{'}$ will be zero in most years, but will record a positive value (say, $x\%$) during the out-performing year, followed by a negative performance ($-x\%$) in the subsequent year.

The S-factor, S_t, is calculated as $S_t = 1 + S_t^{'}$, if we ignore the carry-forward, S_{t-6}.

S_t will be equal to unity in each year, other than in the out-performing year, when it will be equal to $1+x$, and in the subsequent year, when it will be $1-x$.

The cumulative effect of the S-factors is given by the product: $S_1 \times S_2 \times S_3 \times .... S_n$.

After the delta performance, the product will be $1 \times 1 \times 1 \times (1+x) \times (1-x) \times 1 = (1-x^2)$.

If the incentive scheme conformed to its principles, then the product of all S-factors would be equal to one. Instead, however, the distributor, in this instance, continues to be penalised by an amount related to x^2. This is the second order effect.

Incentive rate transition

A further flaw with the current ESCV scheme concerns the effect of changed incentive rates. The ESCV calculated new incentive rates for unplanned SAIFI during the Pricing Review for 2006 to 2010 (see ESCV, 2005a), and these took effect in 2006 and 2007. Further changes to incentive rates were also announced, with the revised rates to be implemented from 2008 onwards. Thus, for UED, the urban incentive rate, which had been set at a value of 0.0276 from 2003 to 2005 (inclusive), increased to 0.0324 for the 2006 and 2007 calendar years, and was then raised further to 0.0515, covering the period from 2008 to 2010. As a result of the transition, an asymmetry was introduced into the scheme whereby performance in a prior year would be rewarded or penalised at a lower rate. The scheme had the potential to give rise to distorted behaviour because distributors which deferred reliability improvements were rewarded more heavily than distribution businesses which brought about reliability improvements at an early stage.

A distributor which postponed capital outlays aimed at enhancing reliability would be penalised at old incentive rates if performance deteriorated in the short term. The subsequent gains in reliability, resulting from implementation of the capital works, would be rewarded at a higher incentive rate.

The example below presents the case of a distributor which invested early to achieve a one-off reduction in unplanned interruption frequencies. The example is stylised but nonetheless gives a realistic portrayal of the resultant rewards and penalties. Table 1-4 shows the results for SAIFI in an urban area. For simplification, we assume that the distributor manages to lower SAIFI in year five, but, for whatever reason, is then unable to maintain the lower frequency of system interruptions from year six onwards.

Table 1-4: Asymmetries caused by changed incentive rates, years 1 to 8.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
SAIFI - urban								
Target performance	1.46	1.34	1.26	1.17	1.06	1.06	1.06	1.06
Actual performance	1.46	1.34	1.26	1.17	0.95	1.06	1.06	1.06
Incentive rate	0.0000	0.0000	0.0276	0.0276	0.0276	0.0324	0.0324	0.0515
Gap	0.0000	0.0000	0.0000	0.0000	0.1100	0.0000	0.0000	0.0000
Raw S-factor (S double dash)	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.356%	-0.567%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Final S factor	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.003564	0.994335
S' t-6	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
X-factor	1.000%	1.000%	1.000%	1.000%	1.000%	14.700%	2.500%	2.500%
Raw PTRM revenue	$300.00	$297.00	$294.03	$291.09	$288.18	$245.82	$239.67	$233.68
Final revenue	$300.00	$297.00	$294.03	$291.09	$288.18	$245.82	$240.53	$233.18
$ reward/ penalty	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.000**	**$0.854**	**-$0.496**

Source: UED analysis. The example is for illustrative purposes, and does not represent actual outcomes.

No rewards or penalties accrue to the distributor over the first six years of the scheme. However, a reward of $854,000 is payable in year seven in recognition of the reliability gains achieved in year five. The reversion of reliability performance to trend, in year six, results in the imposition of an S-factor penalty. The magnitude of the S-factor is greater on the negative side (-0.567% in year eight) than on the positive side (+0.356% in year seven). The observed asymmetry is a direct consequence of the increase in incentive rates.

In dollar terms, the penalty in year eight (-$496,000) is lower than the reward payable to the distributor in year seven (+$854,000) because the S-factor penalty (of -0.567%) is applied to a lower revenue base. However, further penalties are incurred from year nine onwards because second order error, in conjunction with the higher incentive rate, effectively prevents the S-factor from resetting itself.

From year eight to year twelve, revenue remains below the level that the distributor would have earned in the absence of an incentive scheme. The sharper downturn in revenue in year thirteen is a consequence of the carry-forward coming into play. The penalty of -$1.155 million in year thirteen is a reversal of the $0.854 million reward paid in year seven, after adjusting (in effect) for the real interest rate applicable over the period.

The results under the S-factor scheme from year nine to year fifteen are shown below in Table 1-5. The undiscounted sum of rewards and penalties over the fifteen year period is -$2.515 million. The distribution business is therefore subject to a net penalty over the entire time period, despite its success at bringing down SAIFI in one year.

Table 1-5:   Asymmetries caused by changed incentive rates, years 9 to 15

	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
SAIFI - urban							
Target performance	1.06	1.06	0.93	0.93	0.93	0.93	0.93
Actual performance	1.06	1.06	0.93	0.93	0.93	0.93	0.93
Incentive rate	0.0515	0.0515	0.1106	0.1106	0.1106	0.1106	0.1106
Gap	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Raw S-factor (S double dash)	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
Final S factor	1.000000	1.000000	1.000000	1.000000	0.996090	1.006278	1.000000
S' t-6	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.393%**	**-0.624%**	**0.000%**
X-factor	2.500%	2.500%	9.200%	2.500%	2.500%	2.500%	2.500%
Raw PTRM revenue	$227.84	$222.14	$201.70	$196.66	$191.75	$186.95	$182.28
Final revenue	$227.35	$221.67	$201.28	$196.24	$190.59	$186.99	$182.32
$reward/penalty	**-$0.483**	**-$0.471**	**-$0.428**	**-$0.417**	**-$1.155**	**$0.041**	**$0.040**

Source: UED analysis. The example is for illustrative purposes, and does not represent actual outcomes.

1.2.2   Estimating reliability of supply and customer service performance figures for 2010

For the purpose of closing out the ESCV service target incentive scheme, United Energy has had to estimate its performance on reliability of supply and customer service measures in 2010. For the reliability of service measures, namely unplanned SAIDI, unplanned SAIFI and MAIFI, an assumption has been made that performance will gravitate towards an average level by 2013. The assumption rests on the premise that the extensive programme of capital spending proposed by UED will deliver progressive improvements in reliability.

The procedure which has been followed to predict performance levels in 2010 has been documented in simple steps which are explained below:

i.   An arithmetic average of the performance results from 2005 to 2009 was worked out. The unplanned SAIDI, SAIFI and MAIFI indices were then assumed to be equal to these average values in 2013.

ii.   A compound growth rate was calculated for the change in performance from 2009 to 2013. Note that, at present, reliability performance in 2009 is itself based on estimated figures, although actual data has been used for the first nine months of the year.

iii.   The calculated compound growth rate is applied to the performance results for 2009, thus deriving estimates for 2010.

The approach described above has not been used for call centre performance numbers because the call centre series has exhibited less volatility over the few years in which it has been applied. The call centre results for 2010 have been calculated as an average of the calendar year performance levels from 2005 to 2009. The call centre performance result for 2009 is derived from the grade of service statistics reported over the year to September.

The estimated reliability of service performance and customer service performance figures for 2010 are shown below in Table 1-6.

Table 1-6:   Actual results for 2005 to 2008, estimated performance from 2009

	Units	2005	2006	2007	2008	2009	2010
URBAN							
Unplanned (SAIFI)	Index	0.822	0.882	0.963	0.924	1.250	1.173
Momentary (MAIFI)	Index	1.318	1.120	1.012	0.955	1.049	1.059
Unplanned SAIDI	Minutes off-supply	49.735	58.281	57.526	61.530	94.520	85.847
RURAL							
Unplanned (SAIFI)	Index	1.677	1.571	1.395	1.564	1.694	1.665
Momentary (MAIFI)	Index	2.823	1.527	1.650	2.111	3.537	3.187
Unplanned SAIDI	Minutes off-supply	79.738	72.341	89.486	85.069	152.608	135.856
ENTIRE REGION							
Unplanned (SAIFI)	Index	0.950	0.992	1.031	1.026	1.321	1.251
Momentary (MAIFI)	Index	1.544	1.184	1.113	1.138	1.444	1.397
Unplanned SAIDI	Minutes off-supply	54.252	60.520	62.599	65.266	103.741	93.785
ENTIRE REGION							
Call centre performance	per cent	73.79%	72.86%	74.01%	73.03%	71.96%	73.14%

Source: Tariff approval submissions to the ESCV until 2008. Estimated performance figures for 2009, incorporating nine months of actual data. Forecast performance levels for 2010. The numbers in this table differ from those presented in the context of the STPIS discussion owing to the application of different criteria for the treatment of excluded days. The ESCV exclusion regime is based on SAIFI, with an excluded day threshold reading of 0.100. The definition of call centre performance under the ESCV S-factor scheme also differs from that which will be applied under the AER scheme.

United Energy understands that the 2010 performance outcomes will not be known with finality until 2011, and that the AER will be handing down its distribution determination in the latter part of 2010. The projections of network performance and call centre results shown in Table 1-6 will be revised over the course of calendar 2010, and will be updated in time for the revised regulatory proposal which UED will be submitting in mid-2010. However, the possibility of forecast error will nonetheless remain, and so UED, in conjunction with the other Victorian distributors, has proposed a mechanism which can be used on an *ex post* basis (meaning at some stage in calendar year 2011) to adjust the S-factor for differences between the projected and out-turn values of 2010 performance. The "true-up" of S-factor dollar values attributable to performance in 2010 is discussed in section 1.2.5.

1.2.3   Revenue forecasts used when calculating S-factor carry over amounts

For calendar years up to 2008, the revenues used in the S-factor model were the historic values recorded by UED based on distribution use of service (DuOS) charges for prescribed distribution services. From 2009 onwards, the revenue projections were underpinned by separate forecasts of both volume growth and the constituent price series, including the S-factor.

For 2009 and 2010, the revenues were calculated initially using the "existing distribution tariff revenue" amount drawn from the respective tariff models for the two years. The existing distribution tariff revenue is also labelled as the sum of $\left(p_{t-1}q_{t-2}\right)$ in the formal tariff models which have been submitted to the ESCV (and, latterly, to the AER) on an annual basis by UED and other Victorian electricity distributors. The 'existing distribution tariff revenue' was escalated by the price movements in 2009 and 2010, thus giving the values of $\left(p_t q_{t-2}\right)$ for 2009 and 2010. It was then necessary to bring the volumetric components up-to-date.

Annual changes in the volume of energy sold (measured in GWh) were inferred from tariff submissions up until 2008. From calendar year 2009 onwards, energy growth projections were derived from forecasts prepared by the National Institute of Economic and Industry Research (and reported in NIEIR, 2009k2).

The NIEIR energy growth projections for 2008, 2009 and 2010 were used to transform the $\left(p_t q_{t-2}\right)$ aggregates into values representing current quantities, $\left(p_t q_t\right)$. Hence, the $\left(p_t q_{t-2}\right)$ tariff revenue for 2009 was transformed into $\left(p_t q_t\right)$ using the recorded growth in energy sales for 2008 and 2009, while the $\left(p_t q_{t-2}\right)$ tariff revenue for 2010 was transformed into $\left(p_t q_t\right)$ using energy sales growth figures for 2009 and 2010.

The most recent tariff submission prepared by UED has been for 2010, and this was provided to the AER in October 2009. No reliance was placed upon tariff models for the development of S-factor model revenue projections from 2011 onwards.

The forecast revenue series from 2011 to 2018 is underpinned by the expected changes in DuOS tariffs, and the forecast movement in energy sales, aggregated across all tariff classes.

The DuOS tariffs are affected by changes in the underlying price components from 2011 to 2018. The main components can be reported as follows:

- Annual inflation rate. In the tariff model, the inflation rate is normally measured as the year-on-year percentage change in the CPI to the previous September quarter. The inflation rate assumed in developing the forecasts was 2.5% per annum.

- The values of P_0 and X_t, the efficiency components, have been factored in as -16.6% and -4.0%. The value of P_0 is applicable in 2011, while the X-factors have been built in for 2012 to 2015 inclusive. Both P_0 and X_t were taken from the main UED regulatory model. No X-factors have been built in from 2016 onwards (X_t is assumed to equal 0.0%).

- The value of $X_{0,S}$ is 14.80% for 2009, 2010 and 2011 as reported in Volume II of the final decision, EDPR 2006 to 2010 (page 17, ESCV, 2005b). The value of $X_{0,S}$ has been assumed to be -16.6% for each year from 2012 onwards.

- A licence fee recovery, or L-factor is in place for each year out to 2018. The values of the L-factor change each year but are invariably small (between 0% and -0.005%).

- A GST adjustment and a separate adjustment factor (A) were both used in the price control formula, but only up until 2003.

The energy growth figures are reported by NIEIR as electricity sales (Table 7.1, NIEIR, 2009k2), and the data suggests that volumes will remain relatively static over the period from 2009 to 2018. The energy sales figures have been incorporated into the UED S-factor close-out model.

1.2.4 The carry-forward component of the service target incentive system

Under the old S-factor scheme, the carry-forward component was represented by:

$$S'_{t-6} = \frac{S_{t-6}}{1 - X_{0,S}}$$

Where:

S_{t-6} is the value of S_t calculated for the calendar year t-6.

$X_{0,S}$ is the value of X_t for calendar year 2006, calculated exclusive of the impacts of the S-factor.

As noted in section 1.2.3, the value of $X_{0,S}$ for United Energy was set at 14.8% for 2009, 2010 and 2011.

The term "carry-forward" was not used explicitly by the ESCV, but has been employed here for ease of reference. The carry-forward component enters the overall S-factor formulation as follows:

$$S_t = \frac{\left(1 + S'_t\right)}{\left(1 + S'_{t-6}\right)}$$ **Equation 1.1**

The rewards and penalties earned or incurred by UED under the existing S-factor scheme are shown in Table 1-7, which presents a summary of results from 2003 to 2010. The S-factor results are actual outcomes because the underlying performance data was known as at November 2009, the month in which this proposal was submitted. By way of example, the S-factor result of 1.352% for 2010 is based on the reported performance in 2007 and 2008. The reliability of supply and customer service performance measures for 2007 and 2008 were fully recorded and audited as at November 2009. The S-factor percentage outcome of 1.352% is therefore known with certainty. However, the precise impact of the S-factor on UED revenues in 2010 may be subject to revision from the values shown in the

table, depending, *inter alia*, on energy consumption by customers across the various tariff categories.

A pre-tax WACC of 6.3% has been applied to banked percentage values of the S-factor, denoted by $S_{bank,t}$. The application of the pre-tax WACC follows the formulae set out in section 3.1 of the Final Decision, Volume I, EDPR 2006 to 2010 (ESCV, 2005a). The value of 6.3% is drawn from Attachment 4, Volume II (ESCV, 2005b).

Table 1-7 also provides a breakdown of the reward (or penalty) into an annual performance figure and the carry forward amount, attributable to S'_{t-6}. The annual performance component for year t is calculated simply as $(1 + S'_t)$ multiplied by the appropriate revenue base. The carry forward is worked out as shown in Equation 1.3.

More formally, the annual performance component, in dollar terms, is denoted by:

$$Annual\ amount = (1 + S'_t) \times (p_t q_t) \qquad \textbf{Equation 1.2}$$

The carry forward component, in dollar terms, is given by:

$$Carry\ forward = \left[(1 + S'_t) \times (p_t q_t) \times \frac{1}{(1 + S'_{t-6})} \right] - \left[(1 + S'_t) \times (p_t q_t) \right] \quad \textbf{Equation 1.3}$$

The total S-factor reward or penalty is worked out as the sum of Equation 1.2 and Equation 1.3.

The first year in which the carry-forward is calculated is 2009. As shown in Table 1-7, the value of the carry-forward in that year is -$6.683 million. This comprises a significant part of the overall penalty for 2009 of -$9.166 million.

The -$6.683 million carry forward represents a reversal of the $5.651 million reward paid to UED in 2003. If we consider the levels of the numbers only, and not the signs, then the absolute increase in value from $5.651 million to $6.683 million is consistent with a compound rate of interest of 2.83% over six years.

Table 1-7: Performance by UED under the S-factor scheme, 2003 to 2010

		2003	2004	2005	2006	2007	2008	2009	2010
S''t	%	1.954%	-1.387%	0.313%	0.215%	-0.500%	-0.777%	-0.280%	-0.206%
% to the Bank	%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%
Sbank,t	%	0.000%	0.000%	0.000%	0.000%	0.000%	-0.777%	-0.280%	-0.206%
Interest on the banked amount	%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	-0.826%	-0.297%
From current year	%	1.954%	-1.387%	0.313%	0.215%	-0.500%	0.000%	0.000%	0.000%

		2003	2004	2005	2006	2007	2008	2009	2010
S't	%	1.954%	-1.387%	0.313%	0.215%	-0.500%	0.000%	-0.826%	-0.297%
S't-6	%							2.293%	-1.628%
St	%	1.0195	0.9861	1.0031	1.0022	0.9950	1.0000	0.9695	1.0135
S-factor	%	1.954%	-1.387%	0.313%	0.215%	-0.500%	0.000%	-3.050%	1.352%
Actual revenue	$'000	$289,219	$305,000	$304,740	$284,892	$296,616	$297,723	$300,572	$286,272
Revenue post S-factor	$'000	$294,870	$300,770	$305,694	$285,505	$295,134	$297,723	$291,406	$290,142
$ reward (penalty)	$'000	**$5,651**	**-$4,229**	**$954**	**$613**	**-$1,482**	**$0**	**-$9,166**	**$3,871**
Comprised of:									
Annual performance	$'000	$5,651	-$4,229	$954	$613	-$1,482	$0	-$2,483	-$851
S't-6	$'000	$0	$0	$0	$0	$0	$0	-$6,683	$4,722
$ reward (penalty)	$'000	**$5,651**	**-$4,229**	**$954**	**$613**	**-$1,482**	**$0**	**-$9,166**	**$3,871**

Source: UED analysis and results from tariff submissions. The calculation methods are set out in the EDPR 2006 to 2010, ESCV (2005b).

The estimated performance by UED under the old S-factor scheme from 2011 to 2018 is shown below in Table 1-8. UED is fully cognisant that the existing S-factor scheme will have only limited applicability in the new regulatory period. Therefore, the main purpose of Table 1-8 is to set out the expected values under the carry-forward.

The raw S-factor component for 2011, $S_t^{''}$, is based on the change in performance (relative to target) from 2008 to 2009. The performance figures for 2008 are reported and audited, however the full year performance results for 2009 are estimated. The raw S-factor figure for 2012 draws upon estimated performance for 2009 and 2010. The outcomes for reliability of supply and customer service measures in 2010 have been estimated, and the assumptions used have been documented in section 1.2.2.

The assumed outcomes for reliability of service (ROS) variables and the customer service (CS) measure affect the annual performance component of the S-factor calculated for 2011 and 2012. However, the value of the carry forward, $S_{t-6}^{'}$, in 2011 and 2012 is largely invariant to ROS and CS results in 2009 and 2010.

Table 1-8: Estimated performance under the S-factor scheme, 2011 to 2018

		2011	2012	2013	2014	2015	2016	2017	2018
S''t	%	**-5.004%**	**1.284%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**	**0.000%**
% to the Bank	%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sbank,t	%	-5.004%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Interest on the banked amount	%	-0.219%	-5.319%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%

		2011	2012	2013	2014	2015	2016	2017	2018
From current year	%	0.000%	1.284%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
S't	%	-0.219%	-4.035%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
S't-6	%	0.367%	0.180%	-0.418%	0.000%	-0.691%	-0.249%	-0.183%	-3.376%
St	**%**	**0.9942**	**0.9579**	**1.0042**	**1.0000**	**1.0070**	**1.0025**	**1.0018**	**1.0349**
S-factor (%)	%	-0.584%	-4.207%	0.420%	0.000%	0.696%	0.250%	0.183%	3.494%
Actual revenue	$'000	$347,058	$365,013	$365,858	$385,794	$411,661	$429,547	$445,258	$461,615
Revenue post S-factor	$'000	$345,032	$349,641	$367,432	$385,794	$414,599	$430,645	$446,094	$478,161
$ reward (penalty)	$'000	**-$2,026**	**-$15,373**	**$1,574**	**$0**	**$2,938**	**$1,098**	**$836**	**$16,546**
Comprised of:									
Annual performance	$'000	-$759	-$14,727	$0	$0	$0	$0	$0	$0
S't-6	$'000	-$1,267	-$645	$1,574	$0	$2,938	$1,098	$836	$16,546
$ reward (penalty)	$'000	**-$2,026**	**-$15,373**	**$1,574**	**$0**	**$2,938**	**$1,098**	**$836**	**$16,546**
NPV of carry-over to 2012									
Time periods from 2012			0	1	2	3	4	5	6
Applicable discount rate	Pre-tax WACC		1.000	1.063	1.130	1.201	1.277	1.357	1.443
Discounted value	$'000		-$645	$1,481	$0	$2,446	$860	$616	$11,468
Sum of discounted values[1]	$'000		**$1,499**						
Proposed tariff adjustment	Per cent		**0.4107%**						

Note: (1) The sum of discounted values includes the annual performance component for 2012. Source: UED analysis and results from tariff submissions. The calculation methods are set out in the EDPR 2006 to 2010, ESCV. A full year set of results for performance variables was not available for 2009 as at the submission date of this proposal.

UED believes that it is entitled to lodge a claim for the value of the carry forward under the existing ESCV scheme. This would be a sensible way of closing off the current scheme. The values shown in Table 1-8 are reciprocal sums owing, or liabilities arising out of the current regulatory period.

At this stage, the net present value of the carry-over from 2012 to 2018 is forecast to equal $16.227 million in 2012. This amount has been calculated by applying the pre-tax WACC of 6.3% to the S'_{t-6} series that is shown in Table 1-8.

The AER has recognised that there may be amounts owing, or sums to be claimed, in the context of the current S-factor regime, at the end of the regulatory period. In section 4.6.1.2 of the final Framework and Approach paper, (AER, 2009e1), the AER has stated that:

"Benefits and penalties accrued in the current regulatory control period under the ESCV scheme will not be incorporated in the price cap formula. Rather, financial carry-over amounts from the current regulatory period will be included as a building block element in the calculation of allowed revenue for the next regulatory control period."

UED does not concur with the AER position in the F&A paper (AER, 2009e1).

For UED, the carry forward from 2012 to 2018 is comprised of both obligations (penalties to be paid) and entitlements (rewards). We assume that the S-factor to be applied to tariffs in 2011 will be calculated in accordance with the old scheme, and will therefore be as shown in Table 1-8 above. It is proposed to bank the negative value for $S_t^{''}$ that will be reported for 2011.

In order to write-off the ESCV S-factor scheme, UED is proposing that the following steps should be taken:

- An S-factor, calculated under the old scheme, should indeed be applied to the price control formula in 2011. The results for $S_t^{'}$ and $S_{t-6}^{'}$ will be approximately as shown in Table 1-8, subject to revisions to the ROS and CS performance measures for 2009. Separate annual performance and carry forward components should be calculated. Lest there be any doubt, the full ESCV scheme should apply for the 2011 calendar year, even though 2011 is in the new regulatory control period. Note also that UED proposes to use the banking facility in 2011.

- The complete ESCV scheme should, in effect, also be applied to the price control formula for calendar 2012, albeit with modifications. The modifications will have the effect of closing the scheme off completely. The carry forward for calendar 2012 has been estimated at $0.645 million, as shown in Table 1-8. UED considers that the discounted sum of carry forward values from 2013 to 2018 (inclusive) should be added to the 2012 carry-over. The aggregate of all carry forward values from 2012 to 2018 is $16.227 million (note that this amount is not shown in the table). The annual performance result for 2012 is -$14.727 million. Hence, the net effect in 2012 is a small reward equivalent to $1.499 million. This amount can be divided by pre-S-factor revenues to give an estimate of the proposed tariff adjustment for 2012. As is represented in the table, the expected tariff change in 2012, which will bring the ESCV scheme to a conclusion, is +0.4107%. This estimate will be revised before the AER makes its final decision in late 2010.

- The AER STPIS should take effect from the 2013 calendar year. An S-factor calculated under the new STPIS scheme will inchoately affect tariffs from 2013. The S-factor calculation for 2013 will depend upon the results for the ROS and CS performance measures in 2011.

In nominal, undiscounted terms, the carry-over values from 2017 to 2018 will be affected by the decision about whether or not to bank the percentage result for the raw S-factor, $S_t^{''}$ in 2011. However, there is no impact from banking on the NPV of the carry-over series in 2012.

The net result for 2012, which is comprised of the annual performance component for that year, and the discounted sum of carry forward values from 2012 to 2018 could, conceivably, be treated as an operating expenditure line item to be paid in that year. Since the operating expenditure amount would be once only, then there is no case for incorporating an ongoing

allowance into the building block calculation of allowed revenue for UED in the next regulatory period.

However, UED believes that the alternative already proposed, notably the one-off adjustment to tariffs in 2012, offers a 'cleaner' approach. As has been mentioned, the one-off movement would be a small increase equal to 0.4107%.

1.2.5   Correcting the S-factor for year 2010 performance

In the discussion in this section, the term "true-up" can be taken to mean either an initial or a revised forecast which will be provided to the AER prior to the release of its final determination in the latter part of 2010.

The 'true up' for the S-factor values attributable to periods prior to the 2011 to 2015 regulatory period will not be able to factor in an amount which can be ascribed to actual performance on reliability of supply and customer service measures in 2010. This is because the performance results for the full 2010 calendar year will not be known at the time of the determination. Consequently, the true-up will be based on estimated rather than actual, out-turn performance.

The option then exists to correct for the difference between the forecast and actual performance in 2010 once that information becomes available. A correction of this nature is justified because predicting service performance has become difficult owing to the variability of environmental factors. The correction would also be consistent with the original intent behind the ESCV scheme, which was that rewards or penalties would be contingent upon known (rather than projected) performance.

An appropriate means of adjusting for the difference between projected and out-turn performance in 2010 would be to add a correction factor to the price control formula applying to 2012 prices. The tariff model for 2012 prices will be finalised in 2011, and the results for 2010 reliability of supply and customer service performance will be known by this stage. The correction factor would take the form of a one-off adjustment to prices in 2012, with no offsetting factor applicable in 2013. The correction factor would have an enduring impact on prices throughout the remainder of the regulatory period from 2012 to 2015 even though the adjustment will only be undertaken once.

An algebraic formulation for the correction factor could be determined analytically, however UED has determined that this would be unnecessarily complex and would yield little benefit. Accordingly, UED is proposing a correction which will make use of the model used to determine S-factor results for 2012 and subsequent years. The same model will be employed to calculate true-up amounts, after incorporating revised input data. The steps involved in the calculation can be described as follows:

1. The "official" model used to determine the level of price controls for the 2011 to 2015 regulatory control period should be populated with the "official" forecasts, including a best estimate of the performance measures for 2010. It is assumed that the official model will include a formula for calculating the true-up.

2. A true-up of S-factor dollar values will then be calculated. In the official model, the final out-working of this exercise would be the results for P_0 and X factors, and a forecast of annual revenue, (the 'smoothed revenue requirement'), for the period from 2011 to 2015.

3. When the performance figures for 2010 are available, the S-factor true-up values can be re-calculated after substituting the known 2010 performance for the forecast. There will then be different true-up values for the period from 2012 to 2018. Flow-on effects arise under the ESCV scheme, because changes in $S_t^{'}$ for a particular year (in this case, 2012) are not reversed in the subsequent year (in this case, 2013). In addition, a revised value of $S_t^{'}$ in 2012 will give rise to a correspondingly different value for $S_{t-6}^{'}$ in 2018. In the UED model, the dollar value which results from $S_{t-6}^{'}$ in 2018 is discounted back to 2012 using a pre-tax WACC.

4. The required correction in dollar terms will be the difference between the new and original true-up amounts for 2012 to 2015. The original true-up values should be subtracted from the new true-up values. Note that the S-factor dollar result for 2011 is unaffected by performance in 2010, and so can be disregarded for the purpose of this analysis.

5. The required percentage change to the price level can be determined by comparing the correction (described in step 4, above) with the original revenue forecast (the smoothed revenue requirement). More specifically, the net present value (NPV) of the required correction for 2012 to 2015 should be calculated, as should the NPV of the original revenue forecast for the 2012 to 2015 period. The original revenue forecast would be the set of projections approved by the AER in its final determination. The calculation of present values would be achieved using the pre-tax WACC, and both series of numbers (the required correction and the original revenue forecast) would be discounted back to the same point in time (the beginning of 2012).

As a result of the steps described above, the factor that would need to be included in the price control formula as a further multiplicative factor to give effect to the required price change would then be:

$$SFTUCF = 1 + \frac{PV\left(Change\,in\,true-up\,for\,2012\,to\,2015\right)}{PV\left(Forecast\,revenue\,for\,2012\,to\,2015\right)}$$

Equation 1.4

Where $SFTUCF$ stands for the "S-factor true-up correction factor".

In view of the foregoing, the right hand side of the price control formula for 2012 can now be written down as:

$$..... \leq \left(1 + CPI_t\right) \times \left(1 + S_t\right) \times \left(1 + L_t\right) \times \left(1 + SFTUCF\right)$$

It should be emphasised that the tariff formula as set out above is only valid for 2012.

The components of $SFTUCF$, notably the required correction (the numerator) and the original revenue forecast (the denominator), are calculated using values from the relevant years of the regulatory period (2012 to 2015). There is therefore no need to add a further factor to remove the effect. Rather, the intention is that prices should be either higher or lower, on a sustained basis, for the remainder of the regulatory period. The correction factor would be removed automatically at the 2016 price review when prices are realigned with cost.

The correction formula discussed above is designed to deliver the same outcome for distributors as would have been achieved if the performance for 2010 were known at the

time of the price review. The value of the compensation or penalty (in dollar terms) will be affected by various components, including the volumetric drivers of revenue and the extent of other tariff adjustments attributable to the new S-factor and the L factor. The new S-factor is calculated according to the AER STPIS (AER, 2009i2). It is noted that the S factor will be one if performance is on target; however, the L factor is forecast to be less than one because, rather than being a correction, the L factor is instead being used to deduct a small amount.

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