NERA
ECONOMIC CONSULTING

Quantitative Analysis of the Australian Energy Regulator's Proposed Efficiency Incentive Schemes

A Report for the Energy Networks Association

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1. Introduction

NERA Economic Consulting (NERA) has been asked by the Energy Networks Association (ENA) to quantitatively investigate the incentive properties of the Australian Energy Regulator's (AER's) proposed efficiency schemes. This follows the publication of an issues paper by the AER setting out its proposed approach to the development of its draft expenditure incentives guideline.[1] We understand that the AER is intending to release the excel models that it has used to investigate the incentive properties of its proposed incentive mechanism.

Specifically we have been asked to quantify the NSP's benefit share and implied rate of recovery of an Network Service Provider's (NSP)'s actual incurred costs for a number of capital and operating expenditure scenarios. We note that the 'NSP's benefit share' expresses the per cent of the total societal benefits or costs obtained or incurred by a NSP.

These scenarios have been selected to highlight possible inconsistencies between the incentive mechanisms proposed by the AER and the criteria that have been identified to achieve efficient expenditure in network services. For comparative purposes we also consider the incentive power of the existing incentive schemes and the Capital Efficiency Carry-Over Mechanism (CECM), so as to highlight the *incremental* incentive properties of the proposed mechanisms when compared with existing mechanisms.

To investigate the incentive properties of the scenarios, we have constructed models of the existing Efficiency Benefit Sharing Scheme (EBSS), the CECM developed and applied by the Essential Services Commission (ESC) and the Essential Services Commission of South Australia (ESCOSA), and the AER's proposed Capital Expenditure Sharing Scheme (CESS). This has allowed us to estimate the incentive properties of each of the scenarios considered. We also intend to compare our results against those produced by the AER's model of its proposed incentive mechanism, once it has been released.

The remainder of this report is structured as follows:

- Chapter 2 briefly describes the proposed mechanism and sets out the principles relevant to the design of an incentive mechanism;
- Chapter 3 outlines the scenarios and the mechanisms considered;
- Chapter 4 sets out the quantitative results of our analysis for each of the scenarios; and
- Chapter 5 sets out our conclusions arising from the analysis.

[1] Australian Energy Regulator, (2013), *Expenditure incentives guidelines for electricity network service providers*, Issues paper, March.

2. Context

This chapter briefly sets out the context within which our analysis has been undertaken and the principles relevant to a consideration of the design of the incentive mechanisms.

2.1. The AER's proposed expenditure guidelines

On 29 November 2012, the Australian Energy Market Commission (AEMC) made a final determination on new rules governing, among other things, capital expenditure incentives. The rule change allows the AER to apply capital expenditure incentive mechanisms to both transmission and distribution NSPs with the objective of achieving efficient capital expenditure.

The AER has already established an operating expenditure incentive mechanism for all NSPs. The rule change did not affect the AER's scope to include an operating expenditure incentive mechanism within the regulatory framework.

The AER is required to develop capital expenditure incentive guidelines by 29 November 2013. In March 2013, it released an issues paper on the development of guidelines for Network Service Providers (NSPs) and has sought input from interested parties into the development of those guidelines. The issues paper discusses the existing operating expenditure mechanism and the AER's proposed capital expenditure mechanism.

2.2. The expenditure incentive mechanisms

Expenditure incentive mechanisms are designed to encourage NSPs to undertake efficient expenditure and share the benefits/costs of underspend/overspends, relative to forecast expenditure, between NSPs and customers. Operating expenditure incentive mechanisms share incremental operating expenditure efficiency gains and losses between the NSP and customers. Similarly, capital expenditure incentives mechanisms seek to share the benefits and costs of incremental capital expenditure efficiencies that are achieved over time.

The AER's existing operating expenditure incentive mechanism, called the Expenditure Benefit Sharing Scheme (EBSS) has been in place since 2007. [2] The mechanism shares benefits and costs of operating expenditure efficiency improvements between NSPs and customers by ensuring that any incremental under or over spending is retained by the NSP for five years.

The AER has proposed to introduce an exogenously determined operating expenditure allowance based on an industry benchmark. There are a number of approaches that could be used to determine the operating expenditure allowance, depending on the extent that the NSP's outturn operating expenditure influences future benchmarks. We have therefore considered two approaches, namely:

[2] In September 2007, the operating expenditure incentive mechanism was only applicable to DNSPs. In June 2008 it was extended to also apply to TNSPs.

- where the NSP's allowance is based on an industry benchmark calculated with the NSP having a weighting of zero (ie, a complete or 100 per cent exogenous benchmark); and
- where the NSP's allowance is based on an industry benchmark calculated with the NSP having a weighting of 50 per cent (ie, a 50 per cent exogenous benchmark).

For our methodology, the second approach is calculated as the average of an assumed fixed number (ie, the industry benchmark) and the illustrative NSP's outturn operating expenditure in the previous regulatory period. We therefore assume that the 50 per cent exogenous benchmark is influenced both up and down depending on the NSP's outturn operating expenditure.

The AER does not currently have a separate and distinct existing capital expenditure incentive mechanism. Capital expenditure efficiency incentives are provided by actual capital expenditure being rolled into the regulatory asset base (RAB) at the end of each regulatory control period following an ex post review that excludes expenditure deemed 'inefficient'. We note that capital expenditure deferred from one regulatory period is generally included in the allowance for the next regulatory period. However, for comparative purposes in this analysis, we have assumed that any deferred capital expenditure is not included in the capital expenditure allocation of period 2.[3]

The AER is proposing to introduce a capital expenditure incentive mechanism, called the Capital Expenditure Sharing Scheme (CESS). The proposed CESS operates by rewarding/penalising NSPs for any cumulative underspending or overspending relative to the regulatory allowance, at the end of each regulatory control period. This approach presupposes that any over spending relative to the regulatory allowance is 'inefficient'. Similarly, any underspending relative to the regulatory allowance reflects an efficiency improvement.

The AER is proposing to apply an asymmetric benefit sharing ratio under the CESS. The sharing ratio is proposed to be higher for any losses resulting from overspending (ie, a NSP will incur a higher share of the costs of overspending), while the sharing ratio is proposed to be lower for any benefits (ie, a NSP will incur a lower share of the benefits of underspending).

For the illustrative examples considered in this report, we have applied the same example CESS parameters used by the AER in the issues paper.[4] The parameters include:

- a regulatory WACC (which is equal to the firm's actual WACC) of six per cent; and either:
  - a penalty of 70 per cent applied to overspends, and a reward of 30 per cent applied to underspends; or
  - a penalty and reward of 30 per cent applied to both overspends or underspends.

We note that the AER suggests that the CESS could be used with either forecast or actual depreciation, and in conjunction with an ex-post mechanism. We have considered the effect

[3] If this assumption was to be relaxed, there is a risk that an NSP would receive benefits that are multiple times the total benefit to society of any deferral of capital expenditure to subsequent regulatory periods.

[4] See Australian Energy Regulator, (2013), *Better Regulation: Expenditure Incentive Guidelines for Electricity NSPs*, Attachment 3, pp 52–53.

of the mechanism with actual depreciation and with an ex-post mechanism in separate illustrative scenarios.

For the purposes of assessing the AER's proposed CESS, we have considered an alternative capital expenditure incentive mechanism, called the Capital Efficiency Carryover Mechanism (CECM). Variants of the CECM were implemented by regulators in Victoria and South Australia prior to the establishment of the AER. In this assessment we have done our analysis on the basis of the Victorian regime which uses regulatory depreciation, as opposed the South Australian regime which uses actual depreciation. The CECM is, in essence, an EBSS applied to capital expenditure. It shares the benefits and costs of efficiency gains or losses between NSPs and customers by ensuring that an underspend/overspend is retained by the NSP for five years.

2.3. Incentive mechanism design principles

We assess the outcomes of the CESS and the CECM against the National Electricity Objective, which is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity. In particular we identify that the efficient operation of electricity services is promoted where an expenditure incentive mechanism does not distortive expenditure decisions, ie where it:

- provides continuous incentives;
- provides symmetrical incentives relative to the ex-ante forecast;
- provides equal incentives across capital and operating expenditure; and
- provides a NSP with a reasonable opportunity to recover at least its efficient costs;

A continuous incentive describes an incentive rate that is fixed over time (ie, equal in each year of the regulatory control period and between periods). A continuous incentive is necessary to ensure that a NSP defers or advances projects where it is economically efficient to do so. If the incentive rate varies substantially over time a NSP will be encouraged to move capital expenditure between years in spite of efficiency, and could be expected to respond more in the years when the incentive is stronger. Further, we note that the continuity of the incentive rate is important not just within a regulatory period, but across regulatory periods, as the NSP is capable of deferring/advancing projects across regulatory periods.

An effective incentive encourages NSPs to continue to reduce expenditure relative to the forecast regardless of whether the NSP is performing well against the forecast. Asymmetric incentives can contravene this principle by allocating an NSP a greater reward/lesser penalty for increasing expenditure.[5] Furthermore, an incentive that is asymmetric will generate an incentive that is discontinuous over multiple regulatory periods, thereby preventing a NSP from deferring/advancing projects efficiently.[6]

[5] See Scenario 1.

[6] See Scenario 2.

Ideally, the incentive power of an operating and capital expenditure incentive mechanism should be equal. Where it differs the NSP has an incentive to substitute between operating and capital expenditure, even where it may be inefficient to do so.

Finally, the expenditure incentive mechanism should enable the NSP to recover at least its efficient costs. A mechanism that does not provide NSPs with that opportunity will deter further efficient investment in network infrastructure and discourage firms from providing network services.

Based on the quantitative analysis we assess whether the outcomes of the existing and proposed expenditure incentive mechanisms are consistent with these principles.

3. Scenario Descriptions and Modelling Assumptions

To investigate the incentives created and benefit sharing outcomes of alternative incentive mechanisms in a number of circumstances, we have identified a number of illustrative scenarios. This chapter describes each of the scenarios and our approach to assessing the incentives properties of mechanisms relevant to each of the scenarios.

3.1. Scenarios

In total our study considers nine illustrative scenarios, specifically:

- **Scenario 1** – Shifting capital expenditure within a regulatory control period;
- **Scenario 2** – Shifting capital expenditure between regulatory control periods;
- **Scenario 3** – Shifting operating expenditure within a regulatory control period;
- **Scenario 4** – A permanent reduction in operating expenditure between regulatory control periods;
- **Scenario 5** – Unanticipated overspend of capital expenditure that does not satisfy either contingent project or reopener threshold amounts;
- **Scenario 6** – Overspend of capital expenditure that is deemed 'inefficient' as part of an ex-post review. Specifically, we compare how the ex post and ex ante mechanism will work separately and conjointly;
- **Scenario 7** – Substitution between operating and capital expenditure;
- **Scenario 8** – Reliability investments that lead to over expenditure. Specifically, we assess the interaction between the existing service target performance incentive schemes (STPIS) and the existing and alternative capital expenditure incentive mechanisms; and
- **Scenario 9** – Unexpected changes in expenditure caused by higher than anticipated customer growth. Specifically, we consider the taxation implications of higher than anticipated customer growth on the incentive properties of alternative proposed capital expenditure mechanisms.

To determine the effects of each incentive mechanism under these scenarios, we first examine the effect of the existing incentive mechanism, even where that may consist of the absence of a mechanism, and introduce alternative mechanisms with increasingly complex features.

For example, in the case of Scenario 1, we first estimate the NSP's benefit share under the existing mechanism, where capital expenditure is rolled straight into the RAB, then under alternative mechanisms including the CECM and the CESS. The mechanisms assessed under each of the scenarios are summarised in Table 3.1.

Table 3.1
Mechanisms assessed in each of the scenarios[7]

Scenario	Focus	Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
1	Capex	Straight roll into RAB	CECM	CESS (Asy)	CESS (Sym)			
2	Capex	Straight roll into RAB	CECM	CESS (Asy)	CESS (Sym)			
3	Opex	EBSS	Forecasts 100 % exogenous	Forecasts 50 % exogenous				
4	Opex	EBSS	Forecasts 100 % exogenous	Forecasts 50 % exogenous				
5	Capex	Straight roll into RAB	CECM	CESS (Asy)	CESS (Sym)	CESS (actual dep)		
6	Capex	Straight roll into RAB	CECM	CESS (Sym`)	CECM + ex post (adjust)	CESS + ex post (adjust)	CECM + ex post (unadjust)	CESS (Sym) + ex post (unadjust)
7	Capex+Opex	EBSS + Straight roll into RAB	EBSS + CECM	EBSS + CESS (Sym)				
8	Capex	STPIS + straight roll into RAB	STPIS + CECM	STPIS + CESS (Asy)	STPIS + CESS (Sym)			
9	Capex	Straight roll into RAB	CECM	CESS (Asy)	CESS (Sym)			

3.2. Modelling assumptions

The basic modelling assumptions that we have used for the analysis include, (unless otherwise stated):

- the use of forecast depreciation rather than actual depreciation;
- that inflation is equal to zero;
- that the real WACC is equal to 6 per cent;
- that capital expenditure deferred from one regulatory period is not included in the allowance of the subsequent regulatory period;

The choice of modelling assumptions has been to simplify the analysis. Importantly, relaxing these assumptions and increasing the modelling complexity would not materially affect the conclusions to be drawn from the analysis.

In this report we have examined a number of illustrative scenarios of changes in operating and capital expenditure compared to regulatory allowances, each of which result in benefits or costs to society. The benefits arise from the avoidance or delay of otherwise anticipated expenditure, and the costs arise from a need to bring forward expenditure, or incur additional

[7] CESS (Asy) means the Capital Expenditure Sharing Scheme proposed by the AER, with an asymmetrical benefit sharing ratio, ie, 70 per cent of costs borne by an NSP, and 30 per cent of the benefits. CESS (Sym) means the Capital Expenditure Sharing Scheme proposed by the AER, with a symmetrical benefit sharing ratio.

expenditure to deliver network services. The following examples set out the implications for societal benefits and costs of permanent or temporary changes in expenditure:

- a one-off reduction of $6 million in operating expenditure will lead to a $6 million net benefit to society in the same year;
- a permanent reduction of $6 million in ongoing operating expenditure will lead to a $100 million net benefit to society ($6 million divided by an assumed 6 per cent WACC);
- a $100 million deferment in capital expenditure by one year will lead to a $6 million change in net benefits to society ($100 million multiplied by an assumed 6 per cent WACC) in the same year; and
- a one-off reduction of $100 million in capital expenditure will lead to a $100 million net societal benefit.

The sharing ratios calculated in the analysis represent the proportion of net benefits or costs to society received by the NSP and can be used as a metric to evaluate the appropriateness of incentives associated with different schemes. The remaining proportion of the net benefits is passed through to customers through lower distribution tariffs. The sharing ratio can be greater than 100 per cent and less than 0 per cent reflecting a circumstance where an NSP receives more than the benefits or pays more than the costs resulting from changes in expenditure. In addition, it is possible for an NSP to be penalised even when there are net benefits to society from a change in expenditure. To illustrate these cases, Table 3.2 shows the outcomes for an NSP and customers associated with different sharing ratios when $100 million net benefit to society has been accrued.

Table 3.2
Examples of sharing ratios ($100m net benefit to society)

NSP benefits share	Net benefits to NSP	Net benefits to customers
70%	$70m	$30m
125%	$125m	-$25m
-85%	-$85m	$185m

4. Incentive Properties of the Mechanisms

This chapter sets out the results in detail of our quantitative analysis of the illustrative scenarios.

4.1. Scenario 1: Shifting expenditure within a regulatory control period

The first scenario considers a circumstance where a NSP defers or brings forward capital expenditure *within* a regulatory control period.

It is very common for capital expenditure to be shifted during a regulatory control period when compared against expenditure forecast during a regulatory determination.

As a matter of regulatory principle, the incentives provided within the regulatory framework should ensure that an NSP continuously seeks to maximise the efficiency of its expenditure, in response to changing circumstances. In other words, an NSP should have incentives to seek out cost savings during a regulatory period or shift expenditure between years within a period if this would be the most efficient approach to an improved understanding of network conditions, demand or a multitude of other factors that can arise over the course of a regulatory period.

4.1.1. Assessment

To assess the incentive properties of the AER's proposed incentive mechanism we have investigated the sensitivity of the NSP's benefit share to the year in which a deferral or bringing forward of expenditure occurs.

Table 4.1 sets out the NSP's benefit share of a deferral or advancement of expenditure.

Table 4.1
Scenario 1: NSP's benefit share of shifting capital expenditure within a regulatory period

	Existing	***Alt 1***	***Alt 2***	***Alt 3***
Mechanism	Straight roll into RAB	CECM	CESS (Asymmetrical sharing)	CESS (Symmetrical sharing
NSP's Benefit Share	100%*	31.3%	30% reward for deferral 70% penalty for bringing forward	30%

* If we assume some inflation, the NSP's benefit share is equal to the (real WACC)/(real WACC + inflation rate).

The results highlight that the AER's proposed CESS results in an NSP incurring whatever the AER chooses as the benefit share for an overspend, say 70 per cent of the costs of capital

expenditure or advancement in this example. This highlights that the CESS provides the AER with discretion to choose the benefit sharing ratio as compared to the CECM where the mechanism is dependent on the WACC and provides an assumed benefit share of 31.3 per cent when the real WACC is 6.0 per cent.

4.1.2. Summary

Table 4.1 sets out the NSP's benefit share of shifting capital expenditure under each of the mechanisms, assuming that actual cumulative capital expenditure within a regulatory period is equal to the allowance provided at the previous regulatory determination. However, the NSP's benefit share of shifting capital expenditure under the CESS has the potential to vary substantially depending on the choices made by the AER on the benefit sharing ratio.

Table 4.2 summarises our evaluation of the incentive outcomes of the expenditure mechanisms for Scenario 1 against the four principles relevant for incentive mechanism design.

Table 4.2
Scenario 1: Evaluation of mechanisms against the design principles

Design Principles	Existing Roll into RAB	Alt 1 CECM	Alt 2 CESS (Asy)	Alt 3 CESS (Sym)
Continuous	x	✓	✓	✓
Symmetric	✓	✓	x	✓
No distortion (capex/opex)	x	✓	x	✓
Recovery of expected efficient cost	✓	✓	x	✓

4.2. Scenario 2: Shifting expenditure between regulatory control periods

Scenario 2 considers a circumstance where an NSP defers or brings forward capital expenditure across regulatory periods. This scenario is a natural extension of Scenario 1.

As with bringing forward or deferring capital expenditure within a regulatory period, shifting capital expenditure between regulatory periods is a common occurrence for NSPs as they react to changing circumstances.

As for Scenario 1, shifting expenditure between regulatory periods should be encouraged where it is efficient for an NSP to do so, given changes in circumstances over time. In principle, the incentives to shift between regulatory periods should not be affected by the arbitrary timing of a regulatory period.

4.2.1. Assessment

To assess the incentive properties of this scenario we have estimated the NSP's benefit share for a shift of expenditure between the fourth year of the first regulatory period and the second year of the second regulatory period, under each mechanism.

Table 4.3
Scenario 2: NSP's benefit share of shifting capital expenditure between regulatory periods (Yr 4 of Period 1, Yr 2 of Period 2)

	Existing Roll into RAB	***Alt 1*** CECM	***Alt 2*** CESS (Asy)	***Alt 3*** CESS (Sym)
NSP's Benefit Share	-49%	31.3%	-179% (deferral) 279% (bringing forward)	30%

This example illustrates that the benefit share to the NSP from shifting expenditure under the asymmetrical CESS and the existing regime can be negative. This means that despite a deferral of expenditure to a subsequent period being a cost efficiency, the NSP would incur a penalty resulting from the deferral (ie, 49 per cent under the existing approach, and 179 per cent under the proposed asymmetrical CESS).

The asymmetric nature of the AER's proposed asymmetrical CESS means that there is a limited incentive on NSPs to defer or bring forward capital expenditure into subsequent regulatory periods. Any deferral or bringing forward results in the NSP incurring 70 per cent of the overspend in one regulatory period, while only retaining 30 per cent of the benefit in the other regulatory period. In contrast, the CECM and a symmetrical CESS yields a constant NSP benefit share between regulatory periods.

While a deferment of expenditure in the current arrangements (where the deferred expenditure is not included in Period 2's capital expenditure allowance) would also result in a net penalty for the NSP since:

- it would earn a reward in the Period 1 equal to the deferred expenditure multiplied by the WACC in year 5; and
- a penalty in Period 2 in years 8, 9 and 10 of the regulatory period equal to the deferred expenditure multiplied by the WACC.

We have also considered how the timing of the deferral or advancement of expenditure affects the outcome. Under the CECM, we found that the NSP's benefit share of shifting expenditure was independent of the years between which the expenditure shift took place. Conversely, under the existing mechanism and the CESS, the NSP's benefit share of shifting expenditure depends greatly on the timing of the expenditure shift.

To illustrate this point, we have considered how the NSP's benefit share under the CESS changes with the timing of variations in expenditure. Specifically, we have examined circumstance where an NSP:

- defers capital expenditure from the first regulatory period to the second regulatory period – Table 4.4; and

- brings forward capital expenditure from the second regulatory period to the first regulatory period – Table 4.5.

Table 4.4
Scenario 2: NSP's benefit share of deferring of capital expenditure from period 1 to period 2, under an asymmetrical CESS

Period 2 / Period 1	Year 6	Year 7	Year 8	Year 9	Year 10
Year 1	-88 %	-66 %	-49 %	-37 %	-28 %
Year 2	-122 %	-88%	-66 %	-49 %	-37 %
Year 3	-179 %	-122 %	-88%	-66 %	-49 %
Year 4	-294 %	-179 %	-122 %	-88%	-66 %
Year 5	-637 %	-294 %	-179 %	-122 %	-88%

Note that a negative value means that although the deferment has resulted in a net benefit to society, the NSP is penalised by the asymmetrical CESS.

Table 4.4, shows that if a NSP defers $50 million in capex from year 5 to year 6. The NPV (base year 5) benefit of the deferment to society would be $2.8 million. While the impact to the NSP would be a net NPV penalty of $18.0 million:

- a NPV (base year 5) reward in period 1 of $15.0 million (ie, $50 million multiplied by 30 per cent); and
- a NPV (base year 5) penalty in period 2 of $33.0 million (ie, -$47.2 million multiplied by 70 per cent).

As a result, NSP share of the benefit is negative 637 per cent (ie, penalty of -$18.0 million *divided* by $2.8 million gain to society).

Table 4.5
Scenario 2: NSP's benefit/cost share advancing capital expenditure to period 1 from period 2, under the Asymmetrical CESS

Period 2 / Period 1	Year 6	Year 7	Year 8	Year 9	Year 10
Year 1	188%	166%	149%	137%	128%
Year 2	222%	188%	166%	149%	137%
Year 3	279%	222%	188%	166%	149%
Year 4	394%	279%	222%	188%	166%
Year 5	737%	394%	279%	222%	188%

Table 4.5, shows that if a NSP brings forward $50 million in capex from year 6 to year 5. The NPV (base year 5) cost of the bringing forward capex to society would be $2.8 million. While the impact to the NSP would be a net NPV penalty of $20.8 million:

- a NPV (base year 5) penalty in period 1 of $35.0 million (ie, -$50 million multiplied by 70 per cent); and
- a NPV (base year 5) reward in period 2 of $14.2 million (ie, $47.2 million multiplied by 30 per cent).

As a result, NSP share of the cost is 737 per cent (ie, a penalty of -$20.8 million to the NSP *divided* by -$2.8 million cost to society).

The results demonstrate that, under the asymmetrical CESS:

- in some circumstances, a deferral which delivers overall benefits to society can lead to the NSP receiving a penalty (eg, deferring $50 million from year 5 in period 1 to the first year of the subsequent regulatory period);
- in some circumstances, the penalty imposed on the NSP will exceed the additional costs to society of the bringing forward expenditure (eg, bringing forward $50 million from the first year of the subsequent regulatory period to the last year of the preceding period); and
- the share of the penalty or benefit resulting from shifting between regulatory periods varies according to the specific timing of the associated change in expenditure.

The results highlight that the NSP's benefit share under the proposed asymmetrical CESS will vary depending on the year that expenditure varies. This occurs as a consequence of the asymmetric sharing of benefits and so will likely create distortions to efficient shifting of expenditure between regulatory periods.

4.2.2. Summary

This scenario highlights that the AER's proposed asymmetrical CESS creates poor incentives for NSPs to defer capital expenditure between regulatory periods, where this might be otherwise efficient to do. This is in contrast with the CECM and the symmetrical CESS, which provides a continuous incentive to promote efficient expenditure both within and between regulatory periods.

In addition, the proposed CESS also creates incentives to distort a decision to simply defer or bring forward expenditure within a period, despite the constant incentives provided within each period. This is because the combined incentive will vary depending on the year in which the deferral or bringing forward of expenditure occurs.

Table 4.6 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four design principles for Scenario 2.

Table 4.6
Scenario 2: Evaluation of the mechanisms against the design principles

Design Principles	Existing Roll into RAB	Alt 1 CECM	Alt 2 CESS (Asy)	Alt 3 CESS (Sym)
Continuous	x	✓	x	✓
Symmetric	✓	✓	x	✓
No distortion (capex/opex)	x	✓	x	✓
Recovery of expected efficient cost	✓	✓	x	✓

4.3. Scenario 3: Shifting operating expenditure within a regulatory control period.

The third scenario considers a circumstance where a NSP defers or brings forward operating expenditure *within* a regulatory control period.

As with capital expenditure, it is common for operating expenditure to be shifted during a regulatory control period when compared against expenditure forecast during a regulatory determination.

4.3.1. Assessment

Table 4.7 sets out the NSP's benefit share of shifting operating expenditure within a regulatory period. The NSP's benefit share will be sensitive to the WACC under the existing EBSS, but not under the exogenous forecasting approaches. Also, given that the operating expenditure forecast is not adjusted during the regulatory period, the NSP's benefit share is the same for both exogenous mechanisms.

Table 4.7
Scenario 3: NSP's benefit share of shifting operating expenditure within a regulatory period

	Existing	Alt 1	Alt 2
	EBSS	100% exogenous	50% exogenous
NPS's Benefit Share	30%	30%	30%

4.3.2. Summary

This scenario illustrates that under the existing EBSS and proposed exogenous forecasting approaches, the NSP's benefit share of deferring expenditure within a regulatory period is consistent and symmetric across the regulatory period.

Table 4.8 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four design principles for Scenario 3.

Table 4.8
Scenario 3: Evaluation of the mechanisms against the design principles

Design Principles	Existing EBSS	Alt 1 100% exogenous	Alt 2 50% exogenous
Continuous	✓	✓	✓
Symmetric	✓	✓	✓
No distortion (capex/opex)	x	x	x
Recovery of expected efficient cost	✓	✓	✓

The distortion between capital and operating expenditure arises from the interactions between these operating expenditure sharing mechanisms, and the prevailing capital expenditure incentive mechanism. Specifically, the current capital expenditure incentive mechanism provides a non-continuous incentive and when actual depreciation is used, the size of the incentive will depend on the standard life of the substitutable investment.

4.4. Scenario 4: A permanent reduction in operating expenditure

The fourth scenario considers a circumstance where a NSP permanently reduces operating expenditure. This scenario does not address a situation where an NSP is being transitioned from a revealed cost to an exogenous framework (or potentially vice versa).

4.4.1. Assessment

Table 4.9 sets out the NSP's benefit share of permanently reducing operating expenditure. We note that under the alternative mechanism where the forecast is set according to an industry benchmark, the NSP's benefit share differs according to the extent that benchmark is exogenous to the NSP. As the forecasts become more dependent on the actual expenditure of

the NSP, the NSP's benefit share falls. As a result a partially exogenous mechanism will result in the NSP having an incentive rate less than the targeted rate.[8]

Table 4.9
Scenario 4: NSP's benefit share of a permanent reduction in operating expenditure across regulatory periods

	Existing	Alt 1	Alt 2
	EBSS	100% exogenous	50% exogenous
NPS's Benefit Share	31%	30%	19%

4.4.2. Summary

This scenario illustrates that the existing EBSS yields consistent incentives. However, an exogenous mechanism will only yield the target incentive rate if it is 100 per cent exogenous, that is, the forecast operating expenditure is in no way linked to the NSP's outturn expenditure.

Table 4.10 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four efficiency criteria for Scenario 4.

Table 4.10
Scenario 4: Evaluation of the incentive outcomes against efficiency criteria

Design Principles	Existing EBSS	Alt 1 100% exogenous	Alt 2 50% exogenous
Continuous	✓	✓	✓
Symmetric	✓	✓	✓
No distortion (capex/opex)	x	x	x
Recovery of expected efficient cost	✓	✓	✓

As for the previous scenario, the distortion of incentives as between capital and operating expenditure is driven by the interaction with the prevailing capex incentive mechanism.

4.5. Scenario 5: Capital expenditure overspend in any year

Scenario 5 involves considering the incentive mechanism outcomes that result from an unanticipated overspend of capital expenditure relative to the regulatory allowance in any year of a regulatory period.

Differences in capital expenditure compared with regulatory allowances in any year can arise from (amongst other things):

- inherent uncertainties in forecasting capital expenditure into the future;

[8] A partially exogenous opex allowance does not deliver the targeted incentive rate because the NSP's outturn operating expenditure outcomes has a feedback effect which alters the benchmark and thereby the expenditure forecasts.

- changes in underlying network demand, which lead to the need for more network investment to satisfy reliability requirements; and
- input costs change at a greater rate compared with expectations.

In designing an expenditure incentive mechanism there is an inherent trade-off in providing sufficient incentives for businesses to operate within an efficient bound, while simultaneously providing flexibility to a business to respond to changing circumstances.

4.5.1. Assessment

To assess the incentive properties of Scenario 5 we have considered a one off increase in capital expenditure of $29 million (ie, just below the threshold for a contingent project).

We assess the NPS's benefit share of the increase under the existing mechanism, the CECM, the CESS and the CESS with actual depreciation. Table 4.11 illustrates that, under CECM and CESS, the NSP's benefit share is constant irrespective of the year in which the over spend occurs. However, under the existing mechanism and the CESS with actual depreciation, the NSP's benefit share varies depending on the year in which the overspend takes place, creating an incentive to defer any over expenditure until the latter years of the regulatory period, if possible.

Table 4.11
Scenario 5: NSP's benefit share of capital expenditure overspending

		Year 1	Year 2	Year 3	Year 4	Year 5
Existing	Roll into RAB	21%	16%	11%	6%	0%
Alt 1	CECM	31%	31%	31%	31%	31%
Alt 2	CESS (Asy)	70%	70%	70%	70%	70%
Alt 3	CESS (Sym)	30%	30%	30%	30%	30%
Alt 4	CESS (Asy)					
	5 year asset life	133%	120%	106%	89%	70%
	10 year asset life	102%	95%	88%	79%	70%
	20 year asset life	86%	83%	79%	75%	70%
	50 year asset life	76%	75%	74%	72%	70%

Mechanisms depicted as 'Alt 2' and 'Alt 4' in Table 4.11 differ according to the treatment of depreciation in calculations to roll capital expenditure into the RAB. Alt 2 uses forecast depreciation. Alt 4 uses actual depreciation. Under Alt 4, assets with a shorter economic life yield higher incentive rates relative to longer lived assets. It follows that Alt 4, which is an asymmetric CESS using actual depreciation, will not be continuous as it yields incentive rates that fall over the regulatory period. For example, under Alt 4, the penalty for overspending on an investment with a 10 year life in the third year of the regulatory period is 88 per cent, compared with 70 per cent if it were overspent in the fifth year.

We note that the incentive rates generated under a symmetric CESS with actual depreciation will generally reflect the non-continuous results shown above. However, the NSP benefit share will be 40 percentage points lower. For example, under a symmetric CESS with actual depreciation, the penalty for overspending an investment with a 10 year life in the third year of the regulatory period is 48 per cent, compared with 30 per cent if it were overspent in the fifth year.

Further, as shown in Table 4.11, if the penalty for overspend under the CESS is 70% then the penalty to the NSP will exceed 100% when:

- the asset is life is 5 years and the investment occur in years 1, 2 and 3 of the regulatory period; and
- the asset life is 10 years and the investment occur in the first year of the regulatory period.

In these circumstances the consumer receives a net benefit when the NSP overspends against its capital expenditure allowance.

4.5.2. Summary

Scenario 5 also highlights that:

- under the proposed asymmetrical CESS, an NSP will incur 70 per cent of the cost to society of the overspend, with the remaining 30 per cent being allocated to customers;
- under an asymmetric CESS with actual depreciation, the NSP's benefit share varies according to the year in which the overspend occurs, and according to the asset life associated with the over spend;
- a symmetric CESS, with actual depreciation. will not produce a continuous incentive over the regulatory period as depreciation incentive falls over the period; and
- under an asymmetrical CESS with actual depreciation, the NSP may incur a penalty in excess of the total cost to society of a capital overspend, which tends to occur for assets with a shorter life.

For a project that has also satisfied the regulatory investment test, such a penalty would provide poor incentives to promote efficient expenditure.

Table 4.12 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four design principles, for Scenario 5.

Table 4.12
Scenario 5: Evaluation of the mechanisms against the design principles

Design Principles	Existing Roll into RAB	Alt 1 CECM	Alt 2 CESS (Asy)	Alt 3 CESS (Sym)	Alt 4 CESS (actual dep)
Continuous	x	✓	x	✓	x
Symmetric	✓	✓	x	✓	x
No distortion (capex/opex)	x	✓	x	✓	x
Recovery of expected efficient cost	✓	✓	x	✓	x

4.6. Scenario 6: Capital expenditure overspend of that is deemed 'inefficient' as part of an ex-post review

Scenario 6 is essentially the same as Scenario 5 in that it involves considering an unanticipated overspend of capital expenditure. However, as part of this scenario, we consider the incentive mechanism outcomes that would result if the overspend were deemed 'inefficient' as part of an ex post review and so is excluded from the regulatory asset base in the subsequent regulatory period.

4.6.1. Assessment

To illustrate the incremental incentives of each of the regimes we have considered an example similar to that of Scenario 5. In this example the NSP has overspent by $29 million in capital expenditure in the third year of the regulatory period and that overspend is deemed to be 'inefficient' as part of an ex-post review.

We have estimated the share of the penalty borne by the NSP under the existing and six alternative mechanisms, namely the:

1. existing straight rolling into the RAB regime, noting that under the existing regime capital expenditure that is deemed 'inefficient' is not rolled into the RAB;
2. CECM without an ex post review;
3. CESS without an ex post review;
4. CECM with an ex post review, where the adjustment for ex-post inefficient capital expenditure takes into account the penalty already imposed by the ex-ante CECM;
5. CESS with an ex post review, where the adjustment for ex-post inefficient capital expenditure takes into account the penalty already imposed by the ex-ante CESS;
6. CECM with an ex post review, where the adjustment for ex-post inefficient capital expenditure does not take into account the penalty already incurred by the ex-ante CECM; and
7. CESS with an ex post review, where the adjustment for ex-post inefficient capital expenditure does not take into account the penalty already incurred by the ex-ante CESS.

The NSP's benefit share for each of these circumstances is set out in Table 4.13.

Table 4.13
Scenario 6: NSP's benefit share of a deferral and overspend that is found to be partially inefficient

		NSP's benefit share
Existing	Straight roll into RAB	100%
Alt 1	CECM	31%
Alt 2	CESS (Sym)	30%
Alt 3	CECM + ex post (adjusted the CECM)	100%
Alt 4	CESS + ex post (adjusted for the CESS)	100%
Alt 5	CECM + ex post (unadjusted)	114%
Alt 6	CESS (Sym) + ex post (unadjusted)	119%

The results demonstrate that:

- by imposing an ex-post regime, in addition to an ex ante regime, a greater share of the costs of overspending is borne by the NSP; and
- it will be important to ensure that the penalty already imposed through an ex-ante scheme should be taken into account when making any ex-post adjustments, to ensure that the NSP is not penalised in excess of the cost to society of any overspending.

In addition, we also investigated how the NSP's benefit share is affected by the timing of any overspending. We found that any ex-post adjustment results in an NSP bearing a higher penalty for any inefficient overspending that occurs earlier in the regulatory period compared to expenditure later in the period.

4.6.2. Summary

In summary, Scenario 6 demonstrates that the CESS:

- has the potential to penalise NSPs by more than the cost to society of any inefficient overspending, depending on the approach taken to apply an ex-post adjustment; and
- can result in different penalties on an NSP depending on the timing within a regulatory period that inefficient expenditure is found to have been incurred.

This suggests that the AER should consider designing any ex-post adjustment to ensure that the penalty is even and does not exceed the cost to society of the overspending, irrespective of the timing of the expenditure within the regulatory period.

Table 4.14 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four design principles, for Scenario 6.

Table 4.14
Scenario 6: Evaluation of the mechanisms against the design principles

Design Principles	Existing Roll into RAB	Alt 1 CECM	Alt 2 CESS	Alt 3 CECM + ex post (adjust)	Alt 4 CESS + ex post (adjust)	Alt 5 CECM + ex post (unadjust)	Alt 6 CESS + ex post (unadjust)
Continuous	x	✓	✓	✓	✓	x	x
Symmetric	✓	✓	✓	x	x	x	x
No distortion (capex/opex)	x	✓	✓	✓	✓	x	x
Recovery of expected efficient cost	✓	✓	✓	✓	✓	x	x

4.7. Scenario 7: Substitution between operating and capital expenditure

Scenario 7 considers a circumstance where an NSP substitutes between capital expenditure and operating expenditure. This circumstance can arise in a number of ways including (but not limited to):

- opportunities to undertake demand management activities as operating expenditure, which allows for the deferral of network upgrades; and
- changes in accounting policies that redefines certain expenditure previously treated as operating expenditure, as capital expenditure.

In principle an NSP will substitute operating expenditure and capital expenditure to the point where it becomes indifferent between the two. This ensures that a business undertakes activities that lower the total overall cost of providing network services, irrespective of the label attached to the type of expenditure involved. A mechanism creates perverse incentives if it encourages an NSP to substitute capital and operating expenditure away from the point associated with cost minimisation.

4.7.1. Assessment

To examine the incentive properties of the AER's proposed capital expenditure sharing scheme we have analysed the NSP's benefit share for the existing scheme, namely the EBSS scheme, and compared the results to an EBSS scheme combined with a CECM or a CESS. In addition we have considered the change in incentives arising from a substitution between capital and operating expenditure, which results in both an overall benefit and cost to society.

Specifically, our illustrative example assumes that:

- capital expenditure is reduced by $100 million in year 3 of the regulatory period on a non-depreciating asset;
- operating expenditure is increased in perpetuity by:
  - $4 million, which leads to an overall benefit to society from the expenditure substitution;
  - $6 million, which leads to no benefit or cost to society; and
  - $8 million, which leads to an overall cost to society from the expenditure substitution.

Table 4.15 sets out the implications for the allocation of benefits to the NSP and customers under each of these circumstances.

Table 4.15
Scenario 7: Allocation of NPV (Yr 5) benefits from substituting operating and capital expenditure

		Existing	**Alt 1**	**Alt2**
		EBSS + Roll into RAB	EBSS+CECM	EBSS+CESS
Operating expenditure increase	Benefit to Society	Benefit to NSP	Benefit to NSP	Benefit to NSP
–$4 million	$37 million	-$11 million	$12 million	$10 million
–$6 million	$0 million	-$23 million	$0 million	-$1 million
–$8 million	-$37 million	-$34 million	-$12 million	-$13 million

The results demonstrate that:

- where there is a net benefit to society of substituting between capital and operating expenditure (ie, the $4 million operating expenditure example):
  - the current incentive mechanisms result in an NSP being penalised, thereby creating an incentive for the NSP to not undertake the substitution that would otherwise be beneficial to society;
  - a combined EBSS and CECM allocates part of the benefit to an NSP thereby creating an appropriate incentive to substitute;
  - a combined EBSS and CESS allocates part of the benefit to an NSP thereby creating an appropriate incentive to substitute;[9]
- where there is no net benefit to society (ie, the $6 million operating expenditure example):
  - the current incentive mechanisms result in an NSP being penalised, thereby impeding a beneficial substitution;
  - a combined EBSS and CECM results in an NSP being indifferent to the substitution and so does not impede such substitutions from occurring;
  - a combined EBSS and CESS provides a slight penalty to an NSP and so would create an impediment to such a substitution occurring; and
- where there is cost to society (ie, the 8 million operating expenditure example):
  - the current incentive mechanisms result in an NSP being penalised, and so will also impede an NSP undertaking a beneficial substitution;

[9] We note that the asymmetric CESS combined EBSS provides a strong disincentive to expend additional capital expenditure even if it results in an efficient reduction in operating expenditure.

- a combined EBSS and CECM results in an NSP being penalised for the substitution; and
- a combined EBSS and CESS also provides a penalty to an NSP for undertaking the substitution.

This example highlights that there are circumstances where the reward/penalty arising from the CESS creates inappropriate incentives for an NSP considering substituting between capital and operating expenditure.

Relevantly, these results are sensitive to the choice of the illustrative example. Regardless, any incentive mechanism should not create circumstances where the incentives perform appropriately while there are other circumstances where the incentives do not.

4.7.2. Summary

In summary, this scenario highlights that there are some circumstances where an NSP is contemplating substituting between operating and capital expenditure that the AER's proposed CESS can create inappropriate incentives. In our opinion, this outcome is inconsistent with an incentive mechanism that is seeking to provide continuous incentives to an NSP to promote more efficient expenditure outcomes.

Table 4.16 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four efficiency criteria for Scenario 7.

Table 4.16
Scenario 7: Evaluation of the incentive outcomes against efficiency criteria

Design Principles	Existing EBSS + Roll into RAB	Alt 1 EBSS + CECM	Alt 3 EBSS + CESS (Sym)	Alt 2 EBSS + CESS (Asy)
Continuous	x	✓	✓	x
Symmetric	✓	✓	✓	x
No distortion (capex/opex)	x	✓	✓	x
Recovery of expected efficient cost	x	✓	✓	x

4.8. Scenario 8: Reliability investments that lead to over expenditure

Scenario 8 investigates the interaction between the incentives created through the proposed expenditure incentive mechanisms and the current service target performance incentive schemes (STPIS). It is important to consider this interaction when designing an expenditure efficiency incentive scheme, to ensure that incentives promoting expenditure efficiency do not come at the expense of service quality.

The STPIS has been designed to encourage Distribution Network Service Providers (DNSPs) and Transmission Network Service Providers (TNSPs) to improve reliability of network services for customers. The schemes link regulated revenue to the performance of the network, providing a financial benefit to NSPs after incurring the cost of the reliability improving investment.

4.8.1. Assessment

To investigate the combined incentives from the proposed expenditure efficiency scheme and the current STPIS, Scenario 8 considers a circumstance where a DNSP overspends its capital expenditure allowance by $60 million in the third year of a regulatory period to improve network reliability. The combined incentive a DNSP receives will therefore depend on the benefit associated with the STPIS, offset by the penalty incurred through the expenditure efficiency mechanism.

In this scenario, we assume that the:

- System Average Interruption Duration Index (SAIDI) and the System Average Interruption Frequency Index (SAIFI) halve as a result of the overspend;
- incentive rate applicable to the SAIDI and SAIFI are 0.05 and 3 per cent, respectively[10];
- regulatory allowance received by the DNSP in the absence of STPIS is equal to $200m a year; and
- NSP receives 100 per cent of the benefit awarded under the STPIS.

Table 4.17 sets out the allocation of benefits to the NSP under the CECM and CESS.

Table 4.17
Scenario 8: Absolute benefits to a DNSP of overspending capital expenditure to improve reliability outcomes[11]

	Existing Roll into RAB	**Alt 1** CECM	**Alt 2** CESS (Asy)	**Alt 3** CESS (Sym)
STPIS	$43 million	$43 million	$43 million	$43 million
Capital overspend of $50 million	-$7 million	-$21 million	-$47 million	-$20 million
Total net benefit	**$36 million**	**$22 million**	**-$4 million**	**$23 million**

The results demonstrate that the DNSP would pursue the reliability related investment because under a CECM and the symmetrical CESS the STPIS benefit outweighs the penalty from over expenditure. However, under the asymmetrical CESS the penalty to the DNSP does not outweigh the benefit received under the STPIS and so the DNSP would be unlikely to pursue the reliability enhancing investment.

The results in Table 4.17 are sensitive to the assumptions used for this example. However, in any circumstance the expenditure incentive mechanisms regardless of which scheme is in

[10] For more information on the SAIDI, SAIFI and incentive rates see the appendix of the AER's *Electricity Distribution Network Service Providers: Service Target Performance Incentive Scheme*, November 2009.

[11] We are unable to estimate the DNSP's benefit share for this scenario because it would require consideration of the total societal benefits associated with the resultant improved reliability.

place, offsets the benefit from the STPIS and so reduces the incentives on DNSPs to pursue reliability improving investments, when the DNSP is close to over spending its regulatory allowance.

It is important to note that the STPIS mechanism applicable to TNSPs differs to that of DNSPs. However, the mechanisms operate on similar principles (ie, improvements in a DNSP/TNSP's service quality are rewarded by an increase in the revenue allowance). Consequently, the general result also holds for TNSP's.

4.8.2. Summary

In summary, Scenario 8 highlights that:

- the interaction between the incentives under the STPIS and a capital expenditure efficiency scheme can result in beneficial reliability enhancing investments not being pursued; and
- the proposed higher penalty for over spending under the AER's proposed capital efficiency sharing scheme will likely further lower the incentives for NSPs to pursue reliability enhancing investments.

Table 4.18 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four design principles, for Scenario 8.

Table 4.18
Scenario 8: Evaluation of the mechanisms against the design principles

Design Principles	Existing STPIS + Roll into RAB	Alt 1 STPIS + CECM	Alt 2 STPIS + CESS (Asy)	Alt 3 STPIS + CESS (Sym)
Continuous	x	✓	x	✓
Symmetric	✓	✓	x	✓
No distortion (capex/opex)	x	✓	x	✓
Recovery of expected efficient cost	✓	✓	x	✓

4.9. Scenario 9: Unexpected changes in expenditure caused by higher or lower than anticipated customer growth

The current regulatory framework includes a building block of the maximum allowable revenue to compensate the business for the costs associated with taxation. The allowance is calculated based on the expected revenue requirement, plus income received from capital contributions. This ensures that the business is appropriately compensated for the tax costs associated with capital contributions.

The calculation of income from capital contributions is based on an assumption about expected customer connections over the period. In practice, the number of customer connections can vary significantly from these forecasts, which can impact on the income that a business recovers. Any variation from the forecast customer connection income can lead to the business having a higher or lower tax liability compared to the allowance provided for in the regulatory determination. NSPs are unable to influence connection income given obligations to connect customers to the network.

The final scenario examines the incentive properties of the AER's proposed capital expenditure sharing scheme where an expenditure overspend or underspend is caused by

higher or lower than anticipated customer growth compared with the customer growth assumptions provided at the previous regulatory determination. In simple terms, the financial penalty or benefit arising from such an overspend is provided by both the CESS and the higher or lower tax liability incurred by the business resulting from higher or lower capital contributions.

4.9.1. Assessment

To investigate this scenario we have estimated the NSP's benefit share for an overspend that also leads to an increase in the tax liability of the NSP and an underspend that leads to a decrease in the tax liability.

Irrespective of when during a regulatory period an overspend occurs, given the 30 per cent company tax liability created, the customer growth related overspend leads to an NSP incurring a taxation penalty for any additional capital contributions received by the business[12], in addition to the proposed 70 per cent penalty arising from the overspend. The size of the penalty depends on the ratio between capital expenditure overspending and customer contributions.

Similarly, irrespective of when during a regulatory period an underspend occurs, given the avoidance of a 30 per cent company tax liability, the customer growth related underspending leads to an NSP incurring a taxation benefit for any capital contributions not received by the business[13], in addition to the proposed 30 per cent benefit arising from the underspending. As with an overspend, the size of the benefit depends on the ratio between capital expenditure underspending and lower than expected customer contributions.

The combined effect of these penalties is set out in

Table 4.19 for differing circumstances of the ratio between higher or lower growth related capital expenditure and additional or less than expected customer contribution income.

[12] The size of the additional penalty from the tax liability depends on the approach to depreciation used, ie actual or forecast depreciation. If forecast depreciation is used, then the size of the tax liability is partially offset by a lower future taxable income to calculate the tax allowance in subsequent regulatory periods.

[13] The size of the additional penalty from the tax liability depends on the approach to depreciation used, ie actual or forecast depreciation. If forecast depreciation is used, then the size of the tax liability is partially offset by a lower future taxable income to calculate the tax allowance in subsequent regulatory periods.

Table 4.19
Scenario 9: NSP's benefit share of over or under capital expenditure in any year of a regulatory period, including tax liability penalty or benefit

Ratio NSP capex to customer contribution	Higher than forecast customer contributions	Lower than forecast customer contributions
10:1	72%	32%
5:1	75%	35%
2:1	81%	41%
1:1	93%	53%

4.9.2. Summary

This scenario highlights that:

- understanding the cause of any overspend or underspend and the interactions between the AER's proposed capital efficiency sharing scheme and other incentives within the regulatory framework should be taken into consideration when determining the NSP's benefit share within any efficiency framework; and
- the closer the relationship between capital contributions and growth related NSP capital expenditure, the higher the penalty or benefit associated with additional tax liabilities.

This scenario highlights the importance of taking into account the incentives present within the overall regulatory framework when developing incentives to promote more efficient expenditure.

Table 4.20 summarises our evaluation of the incentive outcomes of the expenditure mechanisms against the four efficiency criteria for Scenario 9.

Table 4.20
Scenario 9: Evaluation of the incentive outcomes against efficiency criteria

Design Principles	Existing Roll into RAB	Alt 1 CECM	Alt 2 CESS (Asy)	Alt 3 CESS (Sym)
Continuous	x	✓	x	✓
Symmetric	✓	✓	x	✓
No distortion (capex/opex)	x	✓	x	✓
Recovery of expected efficient cost	✓	✓	x	✓

5. Conclusions

An important role of the regulatory framework applicable to NSPs is to create incentives to promote more efficient outcomes. Designing any regulatory incentive scheme requires consideration of a multitude of factors to ensure that the incentives are sufficiently simple and clear, so that an NSP will respond appropriately in all circumstances.

In principle, we believe that this requires an expenditure efficiency incentive mechanism to:

- provide continuous incentives for efficient expenditure;
- provide symmetrical incentives for efficient investment relative to the determined ex-ante forecast;
- avoid distortions of decisions between capital and operating expenditure; and
- be consistent with the revenue and pricing principles.

The illustrative scenarios suggest that the AER's proposed approach to capital and operating expenditure efficiency sharing mechanisms do not satisfy these principles in many circumstances that commonly arise over and between regulatory periods.

Specifically:

- the asymmetric nature of the proposed benefit sharing scheme results in NSPs having perverse incentives when:
  - bringing forward or deferring expenditure within and between regulatory periods; and
  - efficiently substituting between operating and capital expenditure;
- using actual depreciation within the regulatory framework has the potential to impose a penalty of greater than 100 per cent of the cost to society of any over expenditure on a NSP;
- the approach used by the AER to apply ex-post adjustments for inefficient expenditure could result in an NSP receiving a penalty in excess of 100 per cent if the penalty provided through the CESS is not properly taken into account;
- the interaction between the incentives created under the STPIS and a capital efficiency sharing scheme can result in reliability enhancing investments not being pursued by NSPs, despite the investments being beneficial to customers; and
- NSPs already receive an additional penalty from overspending caused by higher than expected customer connections during a regulatory period due to not being compensated for the additional tax liability created.

It is important to acknowledge that many of these problems arise from the proposal by the AER to provide an asymmetric incentive, ie a higher penalty to an NSP for overspending, and a lower benefit for underspending. This appears to presuppose that all overspending is 'inefficient', and so warrants a higher penalty.

These illustrations highlight that there may be legitimate circumstances where either it is beyond the control of the business to manage expenditure (eg, related to customer connections), or there were sufficient forecasting uncertainties at the last regulatory

determination, which led to actual expenditure differing from forecast – both above and below forecast. The logic of applying an asymmetric incentive does not seem appropriate in these instances.

Appendix A. Incentive Models

A.1. Efficiency Benefit Sharing Scheme (EBSS)

The EBSS used in this report follows 2008 DNSP EBSS guideline. The EBSS is a scheme by which the NSP retains any costs or benefits it accrues through deviations from its expenditure allowances. Key features of the scheme are:

- savings are calculated on an incremental basis; and
- savings are retained for 5 years after the savings are achieved.

Table A.1 shows an example of the model for Scenario 3, ie, a forward shift of expenditure within the regulatory period. In the following example, $10m of expenditure is shifted from year 3 to year 2. This results in:

- an incremental cost of $10m in year 2;
- an incremental saving of $20m in year 3; and
- an incremental cost of $10m in year 4.

As is shown the overall cost to society is $0.67m (in NPV[14] terms) while the share of these costs borne by the NSP is $0.20m (in NPV terms) resulting in a sharing ratio of 30%. Therefore, consumers bear the remaining cost of $0.47m.

[14] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

Table A.1
EBSS model example

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Allowance	100	100	100	100	100	100	100	100	100	100
Actual	100	**110**	**90**	100	100	100	100	100	100	100
Incremental saving	0	-10	20	-10	0	0	0	0	0	0
Carry over of gains										
Yr 1		0	0	0	0	0				
Yr 2			-10	-10	-10	-10	-10			
Yr 3				20	20	20	20	20		
Yr 4					-10	-10	-10	-10	-10	
Yr 5						0	0	0	0	0
Yr 6							0	0	0	0
Yr 7								0	0	0
Yr 8									0	0
Yr 9										0
Yr 10										
Discount factor	1.26	1.19	1.12	1.06	1.00	0.94	0.89	0.84	0.79	0.75
Effective target	100.00	100.00	100.00	100.00	100.00	100.00	100.00	110.00	90.00	100.00
PV net benefit (cost) to society	0.00	-11.91	11.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PV NSP benefit	0.00	-11.91	11.24	0.00	0.00	0.00	0.00	8.40	-7.92	0.00
PV Total benefit	0.00	-11.91	11.24	0.00	0.00	9.43	8.90	8.40	7.92	7.47
NPV total societal benefit (cost)	-0.67									
NPV benefit (cost) to NSP	-0.20									
Total benefit (cost) to NSP	-0.20									
Share of reward (penalty) to NSP	30%									

A.2. Exogenous 100%

The exogenous 100% model assumes that allowance for a regulatory period is 100% determined exogenously, ie, expenditure in the previous period has no influence on it.

Table A.2 shows an example of the model for Scenario 3, ie, a forward shift of expenditure within the regulatory period. In the following example, 10 million of expenditure is shifted from year 3 to year 2. This results in:

- an incremental cost of $10m in year 2
- an incremental saving of $10m in year 3

Again the overall cost to society is $0.67m (in NPV[15] terms) while the share of these costs borne by the NSP is $0.20m resulting in a sharing ratio of 30%. Therefore, consumers incur a cost of $0.47m.

Table A.2
Exogenous 100% OPEX model example

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Allowance	100	100	100	100	100	100	100	100	100	100
Actual	100	**110**	**90**	100	100	100	100	100	100	100
Incremental saving	0	-10	10	0	0	0	0	0	0	0
Incwentive reward/penalty						0.50				
Discount factor	1.26	1.19	1.12	1.06	1.00	0.94	0.88	0.83	0.78	0.73
Effective target	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
PV NSP benefit	0.00	-11.91	11.24	0.00	0.00	0.47	0.00	0.00	0.00	0.00
PV Total benefit	0.00	-11.91	11.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPV total societal benefit (cost)	-0.67									
NPV benefit (cost) to NSP	-0.20									
Total benefit (cost) to NSP	-0.20									
Share of reward (penalty) to NSP	30%									

[15] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

A.3. Exogenous 50%

The exogenous 50% model assumes that allowance for a regulatory period is determined by an equal weighting of an exogenous amount and the expenditure in the second to last period in the previous regulatory period.

Table A.3 shows an example of the model for Scenario 3, ie, a forward shift of expenditure within the regulatory period. In the following example, 10 million of expenditure is shifted from year 3 to year 2. This results in:

- an incremental cost of $10m in year 2
- an incremental saving of $10m in year 3

Again the overall cost to society is $0.67m (in NPV[16] terms) while the share of these costs borne by the NSP is $0.20m resulting in a sharing ratio of 30%. Therefore, consumers incur a cost of $0.47m.

Table A.3
Exogenous 50% OPEX model example

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Allowance	100	100	100	100	100	100	100	100	100	100
Actual	100	**110**	**90**	100	100	100	100	100	100	100
Incremental saving	0	-10	10	0	0	0	0	0	0	0
Incwentive reward/penalty						0.50				
Discount factor	1.26	1.19	1.12	1.06	1.00	0.94	0.88	0.83	0.78	0.73
Effective target	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
PV NSP benefit	0.00	-11.91	11.24	0.00	0.00	0.47	0.00	0.00	0.00	0.00
PV Total benefit	0.00	-11.91	11.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NPV total societal benefit (cost)	-0.67									
NPV benefit (cost) to NSP	-0.20									
Total benefit (cost) to NSP	-0.20									
Share of reward (penalty) to NSP	30%									

[16] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

A.4. Current Capital Expenditure Model

Table A.4 shows an example of the current capital expenditure model under Scenario 1 – shifting expenditure within the period. The example shows a shift of $50m in capital expenditure from year 2 to year 3. The calculations have been done based on forecast depreciation rather than actual depreciation.

The result is that there is a reduction in the opening RAB of year 3 between the actual and allowance scenarios which results in a difference in the return on capital equal to the WACC multiplied by the difference or $3.00m ($3.37m in NPV[17] terms) in this example. This difference represents a benefit to both society and the NSP. It then follows that the share of the reward to the NSP is 100%.

Table A.4
Current capital expenditure model

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Allowance	100	100	100	100	100
Actual	100	**50**	**150**	100	100

Roll Forward Allowance (constant dollar)					
	Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
ORAB	1,000.0	1,075.0	1,130.0	1,165.0	1,180.0
Depreciation	25.0	45.0	65.0	85.0	105.0
Capex	100.0	100.0	100.0	100.0	100.0
CRAB	1,075.0	1,130.0	1,165.0	1,180.0	1,175.0

Roll Forward Actual (constant dollar)					
	Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
ORAB	1,000.0	1,075.0	1,080.0	1,165.0	1,180.0
Depreciation	25.0	45.0	65.0	85.0	105.0
Capex	100.0	50.0	150.0	100.0	100.0
CRAB	1,075.0	1,080.0	1,165.0	1,180.0	1,175.0

Closing RAB Allowance vs Closing RAB Actual

Allowance	1,175.0
Actual	1,175.0
Saving	0.0

Calculation of the No Incentive

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Capex allowance	100	100	100	100	100
Actual Capex	100	50	150	100	100
Saving	0	50	-50	0	0
Cost incurred		0.00	3.00	0.00	0.00
Discount factor	1.26	1.19	1.12	1.06	1.00

NPV total societal benefit (cost)	3.37
NPV benefit (cost) to NSP	3.37
Depreciation reward (penalty)	0.0
Total cost to NSP	3.4
NPV reward (penalty) already recovered by NSP	3.4
NPV of remaining reward (penalty) imposed on NSP	0.0
Share of reward (penalty) to NSP	100%

[17] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

A.5. Capital Efficiency Carry-Over Mechanism (CECM)

The CECM model is conceptually similar to EBSS except applied to capital expenditure. In the following example we have calculated on the basis of the Victorian regime using regulatory depreciation, as opposed the South Australian regime which uses actual depreciation.

Table A.5 shows an example of the model for Scenario 2, ie, shifting expenditure between across periods. In this example $50m in capital expenditure is shifted from year 4 to year 7 or the second year of the second regulatory period. In year 4 this results in a saving of $50m and therefore an efficiency gain of $3m. The NSP is then able to hold onto that gain for the following 5 periods. Similarly, in year 7 the increase in expenditure by $50m gives rise to an efficiency loss of $3m for the subsequent 5 periods. The net benefit to society is equal to the NPV[18] of the savings, $8.5m, while the net benefit to the NSP is equal to the NPV of the efficiency gains/losses, $2.66m, giving a benefit sharing ratio of 31.3%.

[18] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

Table A.5
CECM model example

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr11	Yr 12	Yr13	Yr14	Yr15
Allowance	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Actual	100	100	100	**50**	100	100	**150**	100	100	100	100	100	100	100	100
Saving	0	0	0	50	0	0	-50	0	0	0	0	0	0	0	0
Efficiency gain	0	0	0	3	0	0	-3	0	0	0	0	0	0	0	0
Carry over of gains															
Yr 1		0	0	0	0	0									
Yr 2			0	0	0	0	0								
Yr 3				0	0	0	0	0							
Yr 4					3	3	3	3	3						
Yr 5						0	0	0	0	0					
Yr 6							0	0	0	0	0				
Yr 7								-3	-3	-3	-3	-3			
Yr 8									0	0	0	0	0		
Yr 9										0	0	0	0	0	
Yr 10											0	0	0	0	0
Discount factor	1.26	1.19	1.12	1.06	1.00	0.94	0.89	0.84	0.79	0.75	0.70	0.67	0.63	0.59	0.56
1/WACC	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67
PV NSP benefit	0.00	0.00	0.00	3.18	3.00	2.83	0.00	0.00	0.00	-2.24	-2.11	-2.00	0.00	0.00	0.00
NPV total societal benefit (cost)	8.50														
NPV benefit (cost) to NSP	2.66														
Total cost to NSP	2.66														
Share of reward (penalty) to NSP	31.3%														

A.6. Capital Expenditure Sharing Scheme (CESS) - Asymmetric

The CESS model is proposed method of incentivising efficiency in expenditure by an NSP. In the asymmetric case presented here the NSP is entitles to earn 30% of total net benefits and incurs 70% of the total net costs.

Table A.6 show an example of the model for Scenario 2, ie, shifting expenditure between regulatory periods. In the example, $50m in capital expenditure is shifted from year 4 to year 7 or the second year of the second regulatory period. In the first regulatory period, see Table A.6, there is a total net benefit to society equal to the NPV[19] of the savings which is $53m. Since a net benefit has occurred, the NSP is entitled to a 30% share, ie, $15.9m. The NSP has already recovered a benefit of $3m within Period 1 (through a higher than necessary return of capital which was based on forecast capex). As a result the CESS provides an additional efficiency reward of $12.9 (in NPV terms) in Period 2 revenues.

[19] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

Table A.6
CESS model - Regulatory Period 1 – Asymmetric

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Allowance	100	100	100	100	100
Actual	100	100	100	**50**	100

Roll Forward Allowance (constant dollar)					
	Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
ORAB	1,000.0	1,075.0	1,130.0	1,165.0	1,180.0
Depreciation	25.0	45.0	65.0	85.0	105.0
Capex	100.0	100.0	100.0	100.0	100.0
CRAB	1,075.0	1,130.0	1,165.0	1,180.0	1,175.0

Roll Forward Actual (constant dollar)					
	Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
ORAB	1,000.0	1,075.0	1,130.0	1,165.0	1,130.0
Depreciation	25.0	45.0	65.0	85.0	105.0
Capex	100.0	100.0	100.0	50.0	100.0
CRAB	1,075.0	1,130.0	1,165.0	1,130.0	1,125.0

Closing RAB Allowance vs Closing RAB Actual

Allowance	1,175.0
Actual	1,125.0
Saving	50.0

Calculation of the Reward

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Capex allowance	100	100	100	100	100
Actual Capex	100	100	100	50	100
Saving	0	0	0	50	0
Cost incurred		0.00	0.00	0.00	3.00
Discount factor	1.26	1.19	1.12	1.06	1.00

NPV total societal benefit (cost)	53.0
NPV benefit (cost) to NSP	15.9
Depreciation reward (penalty)	0.0
Total cost to NSP	15.9
NPV reward (penalty) already recovered by NSP	3.0
NPV of remaining reward (penalty) imposed on NSP	12.9
Share of reward (penalty) to NSP	30%

In the second regulatory period the NSP would overspend relative to its allowance by $50m in year 7 (or $44.5m in NPV terms) – see Table A.7. Since the NSP has overspent it bears 70% of the additional cost (ie, $31.1m in NPV terms). The NSP has already incurred a cost of $7.1m within Period 2 and so the CESS imposes an additional penalty in Period 3 of $24.0m in the NSP revenue requirement.

Table A.7
CESS Model - Regulatory Period 2 - Asymmetric

	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Allowance	100	100	100	100	100
Actual	100	**150**	100	100	100

Roll Forward Allowance (constant dollar)					
	Yr 6	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**
ORAB	1,125.0	1,110.0	1,075.0	1,020.0	945.0
Depreciation	115.0	135.0	155.0	175.0	195.0
Capex	100.0	100.0	100.0	100.0	100.0
CRAB	1,110.0	1,075.0	1,020.0	945.0	850.0

Roll Forward Actual (constant dollar)					
	Yr 6	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**
ORAB	1,125.0	1,110.0	1,125.0	1,070.0	995.0
Depreciation	115.0	135.0	155.0	175.0	195.0
Capex	100.0	150.0	100.0	100.0	100.0
CRAB	1,110.0	1,125.0	1,070.0	995.0	900.0

Closing RAB Allowance vs Closing RAB Actual

Allowance	850.0
Actual	900.0
Saving	-50.0

Calculation of the Penalty

	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Capex allowance	100	100	100	100	100
Actual Capex	100	150	100	100	100
Saving	0	-50	0	0	0
Cost incurred		0.00	-3.00	-3.00	-3.00
Discount factor	0.94	0.89	0.84	0.79	0.75

NPV total societal benefit (cost)	-44.5
NPV benefit (cost) to NSP	-31.1
Depreciation reward (penalty)	0.0
Total cost to NSP	-31.1
NPV reward (penalty) already recovered by NSP	-7.1
NPV of remaining reward (penalty) imposed on NSP	-24.0
Share of reward (penalty) to NSP	70%

As Table A.8 shows, the net result of this deferment in expenditure is a net benefit to society of $8.5m ($53m minus $44.5m). Due to the asymmetry of the incentives, the NSP in turn has been penalised by $15.2m (in NPV terms) while customers benefit from the deferment of capex by $23.7m (in NPV terms). As a result, the NSP has incurred costs while society and customers have gained.

Table A.8
Total Costs and Benefits over two regulatory periods - Asymmetric

NPV total societal benefit (cost)	8.5
NPV benefit (cost) to NSP	-15.2
Depreciation reward (penalty)	0.0
Total cost to NSP	
NPV reward (penalty) already recovered by NSP	-4.1
NPV of remaining reward (penalty) imposed on NSP	-6.7
Share of reward (penalty) to NSP	-179%

A.7. Capital Expenditure Sharing Scheme (CESS) – Symmetric

This section presents an example identical to the one above except with a symmetrical factor of 30% applied to both the share of benefits and costs accrued by the NSP.

Table A.9, Table A.10 and Table A.11 show an example of the model for Scenario 2, ie, shifting expenditure between regulatory periods. In the example, $50m in capital expenditure is shifted from year 4 to year 7 or the second year of the second regulatory period.

The first period outcome is identical the one above, where a 30% share of benefits is received. In the first regulatory period, see Table A.9, there is a total net benefit to society equal to the NPV[20] of the savings which is $53m. The NSP has already recovered a benefit of $3m within Period 1, and so the CESS provides an additional reward of $12.9m (in NPV terms) in the revenue requirement of Period 2.

[20] Note that all Net Present Value figures quoted in Appendix A are in year 5 dollars.

Table A.9
CESS model - Regulatory Period 1 – Symmetric

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Allowance	100	100	100	100	100
Actual	100	100	100	**50**	100

Roll Forward Allowance (constant dollar)					
	Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
ORAB	1,000.0	1,075.0	1,100.0	1,075.0	1,000.0
Depreciation	25.0	75.0	125.0	175.0	225.0
Capex	100.0	100.0	100.0	100.0	100.0
CRAB	1,075.0	1,100.0	1,075.0	1,000.0	875.0

Roll Forward Actual (constant dollar)					
	Yr 1	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**
ORAB	1,000.0	1,075.0	1,100.0	1,075.0	950.0
Depreciation	25.0	75.0	125.0	175.0	225.0
Capex	100.0	100.0	100.0	50.0	100.0
CRAB	1,075.0	1,100.0	1,075.0	950.0	825.0

Closing RAB Allowance vs Closing RAB Actual

Allowance	875.0
Actual	825.0
Saving	50.0

Calculation of the Reward

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Capex allowance	100	100	100	100	100
Actual Capex	100	100	100	50	100
Saving	0	0	0	50	0
Cost incurred		0.00	0.00	0.00	3.00
Discount factor	1.26	1.19	1.12	1.06	1.00

NPV total societal benefit (cost)	53.0
NPV benefit (cost) to NSP	15.9
Depreciation reward (penalty)	0.0
Total cost to NSP	15.9
NPV reward (penalty) already recovered by NSP	3.0
NPV of remaining reward (penalty) imposed on NSP	12.9
Share of reward (penalty) to NSP	30%

In the second regulatory period there is a total cost to society in NPV terms is $44.5m – see Table A.10. The NSP incurs a 30% share of this costs equal ie, $13.3m (in NPV terms). The NSP will incur $7.1m of this cost with Period 2 and so the CESS will impose an additional penalty of $6.2m (in NPV terms) in the cash flows of Period 3.

Table A.10
CESS model - Regulatory Period 2 – Symmetric

	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Allowance	100	100	100	100	100
Actual	100	**150**	100	100	100

Roll Forward Allowance (constant dollar)					
	Yr 6	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**
ORAB	825.0	675.0	475.0	225.0	-75.0
Depreciation	250.0	300.0	350.0	400.0	450.0
Capex	100.0	100.0	100.0	100.0	100.0
CRAB	675.0	475.0	225.0	-75.0	-425.0

Roll Forward Actual (constant dollar)					
	Yr 6	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**
ORAB	825.0	675.0	525.0	275.0	-25.0
Depreciation	250.0	300.0	350.0	400.0	450.0
Capex	100.0	150.0	100.0	100.0	100.0
CRAB	675.0	525.0	275.0	-25.0	-375.0

Closing RAB Allowance vs Closing RAB Actual

Allowance	-425.0
Actual	-375.0
Saving	-50.0

Calculation of the Penalty

	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Capex allowance	100	100	100	100	100
Actual Capex	100	150	100	100	100
Saving	0	-50	0	0	0
Cost incurred		0.00	-3.00	-3.00	-3.00
Discount factor	0.94	0.89	0.84	0.79	0.75

NPV total societal benefit (cost)	-44.5
NPV benefit (cost) to NSP	-13.3
Depreciation reward (penalty)	0.0
Total cost to NSP	-13.3
NPV reward (penalty) already recovered by NSP	-7.1
NPV of remaining reward (penalty) imposed on NSP	-6.2
Share of reward (penalty) to NSP	30%

As Table A.11 shows, the net result of this shift in expenditure is a net benefit to society of $8.5m ($53m minus $44.5m), the same result as in the previous example. The NSP in turn receives a benefit of $2.6m (in NPV terms), giving a sharing ratio of 30%.

Table A.11
Total benefits/costs across the two regulatory periods – Symmetric

NPV total societal benefit (cost)	8.5
NPV benefit (cost) to NSP	2.6
Depreciation reward (penalty)	0.0
Total cost to NSP	
NPV reward (penalty) already recovered by NSP	-4.1
NPV of remaining reward (penalty) imposed on NSP	11.1
Share of reward (penalty) to NSP	30%

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