Implementing static efficiency and returns to investors

A report for TenneT

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Final Report

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IMPORTANT NOTICE

1. INTRODUCTION

CEPA has been commissioned by TenneT to prepare an independent report on the treatment of static efficiency by the NMa within the determination of the allowed revenue of TenneT Transmission System Operator (TSO) B.V.'s regulated activities.

TenneT is the operator of the Dutch national grid network and is licensed to operate high (HS) and extra-high (EHS) voltage grids. The company is fully owned by the Dutch government.

This report focuses solely on the regulated activities of TenneT's TSO B.V. business (hereafter simply referred to as TenneT) in the Netherlands.

The application of a static efficiency adjustment to total costs at each determination is an issue that has been identified as creating potential risks for companies. The situation that might arise is:

- depreciation charges do not cover the actual investment costs (or the efficiently incurred costs initially included into the Regulatory Asset Base (RAB));
- the allowed profits on the RAB are also adjusted down in line with the efficiency analysis and consequently no compensating higher return (in place of the shortfall of the depreciation charge needed to cover efficiently incurred costs) arises; and
- no allowance is made in the Weighted Average Cost of Capital (WACC) estimation for the impact of the risk of under-recovery of efficiently incurred costs.

If this occurs, a company will be unable to earn its required return and consequently investment into the sector will potentially be value-destroying for shareholders.

The concern is that the NMa, the Dutch energy regulator, applies this type of approach and consequently has created difficulties for TenneT.

We have been asked by TenneT to assess the ways in which a static efficiency adjustment can be applied and the resulting calculations to yield the theoretical correct required revenue (i.e. to ensure financeability and an appropriate return to shareholders) and the implications of the different approaches (for example, with regard to the speed of recovery of money).

Note; we have not been asked to make any assessment of the 'accurate' static or dynamic efficiency adjustment nor to make an assessment of the application of a dynamic efficiency adjustment or any other aspect of TenneT's regulatory regime.

We have approached this assignment by:

- Considering the theoretical application of a static efficiency adjustment and its links to the theory of incentive regulation, key accounting and financial issues (such as capital maintenance) and the way in which regulated returns need to be set (Section 2).

- Considering the approach adopted in practice by the NMa to calculate TenneT's allowed revenues and specifically its current application of a static efficiency adjustment within the allowed revenue formula (Section 3).
- Comparing the NMa's approach to alternative ways of applying a 'static' efficiency adjustment in order to inform an assessment of the NMa approach and whether it meets the requirements for the application of static efficiency under incentive regulation (Section 4).

Section 5 of the report then concludes with a summary of our findings and our view as to whether the NMa's existing application of a static efficiency adjustment, limits returns to investors below the required return.

The work presented here for TenneT is a separate and unconnected piece of work to that recently undertaken for the NMa on the methodological approach to dynamic efficiency and the estimation of dynamic efficiency for the various energy sectors they regulate. That work was the basis of a consultation by the NMa in late 2012. No confidential information learned during that project and relevant to the work undertaken for TenneT was used in the preparation of this report.

2. STATIC EFFICIENCY AND INVESTOR RETURNS

Before considering the application of static efficiency to total costs it is worth reviewing some of the basic concepts and objectives of incentive regulation. These aspects of incentive regulation are obviously very important in terms of determining the returns that investors expect.

2.1. Objectives of incentive based regulation

The purpose of 'incentive regulation' through periodic controls of maximum prices or allowed revenue is to control the potential abuse of monopoly power (or dominant position within a market) and to give incentives to improve efficiency and performance. Effectively it is replicating the working of a competitive market where pressure to reduce costs will exist.[1]

Given this purpose, typically incentive regulation of utility companies has involved a number of objectives including:

- allowing for an efficient regulated company to finance its activities, the opex and additions to the capital stock (i.e. new capex), given the cost of capital and assets employed within the business;
- setting cost reflective prices for different classes of consumers as well as current and future consumers (through, for example, the approach to depreciation); and
- providing incentives for efficiency and performance under the regulatory settlement, with a system of sharing under- and out-performance between consumers and investors.

Regulators tend to think of three forms of efficiency:

- *productive* – which relates to the use of the best or most appropriate technology for delivering the service given the scale of the market;
- *allocative* – which focuses companies on ensuring prices are cost reflective and consequently demand for services leads to the appropriate level of resources, labour and capital being deployed in the sector; and
- *dynamic* – where companies are encouraged to adopt innovative solutions, new technologies etc and so keep prices as low as possible in the medium- to long-term.

Incentive regulation is a forward looking system which means that financial and accounting forecasts and principles are an important element in determining allowed revenue and the setting of maximum price or revenue controls. It also means that past expenditure and investment into companies must be dealt with consistently and appropriately in the models used to set allowable revenue, otherwise the 'regulatory contract' on which incentive regulation is based may be unduly breached and

[1] The classic academic exposition of the theory of incentive regulation is provided in Laffont and Tirole (1993): 'A Theory of Incentives in Procurement and Regulation'

incentives for efficiency and investment may be eroded.[2] The 'regulatory contract', whether implicit or explicit, is important since it is an understanding of the way in which the regulatory regime will be employed and so allows management, investors and consumers increased certainty about the regime. With respect to investors this then allows the provision of finance at as low cost as possible and ensures that the 'repeated game' of investment is undertaken. If a regulator breaks the regulatory contract investors are likely to penalise the system by either increasing the cost of capital owing to the greater perceived risk or by not investing – this is why we consider regulation a repeated game which needs to be played by the agreed rules.[3]

Utility regulators have adopted many different systems and regimes of applying incentive regulation. In some contexts, incentives have been driven from the way in which price controls are set (e.g. price versus revenue caps and the duration of the price control). In other circumstances, regulators have looked to develop specific rules for sharing of total expenditure out-performance and efficiency which mean that economic profits can be earned by companies over and above the 'normal' rate of return required to meet the cost of capital for the business.

In the UK, regulators have also looked to develop the framework of incentive regulation further, through more explicit incentives for the delivery of environmental outputs and network innovation rather than simply to focus on the efficiency of inputs.

The focus on efficiency has also been reflected in the way that different elements of a company's expenditure have been incentivised in the UK. For example some cost elements are incentivised through:

- an ex ante benchmark being established based on an efficient company with no ex post adjustment (such as the cost of capital); or
- an ex ante allowance being established based on an efficient company with an ex post adjustment being employed at some point in the future (this has tended to be the approach for opex and capex).

What is common for both these approaches, however, is that once an initial efficiency adjustment has been made to the forecast new capex (the ex ante allowance) there is no further adjustment to the values – except for an ex post inclusion into the RAB. UK regulators do not re-open previous controls and investigate the investment that was agreed to be undertaken in those price controls. The ultimate version of this is that for UK regulated companies, especially those privatised from the late 1980s, there is normally an initial opening value to the RAB which is sacrosanct and at the end of a price control period this updated RAB value effectively becomes unchangeable. This is explained in more detail in Box 2.1 below.

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[2] See CRI Research Report (1998): 'Accounting Requirements for Regulated Industries'

[3] This, of course, does not mean that the rules cannot change. Rather, it means any change to the rules of the game need to be properly developed through consultation and the implications of any rule change fully understood. However, once regulatory rules have been developed and agreed on, the regulator should not take retrospective action which conflicts with the rules established at the time they were agreed.

Box 2.1: General UK approach to efficiency incentives

Ex ante / ex post approach to efficiency
UK regulators have tended to adopt an ex ante / ex post approach to incentivise efficiency through their price regulatory regimes. The strength of efficiency incentives are generated through the period companies are allowed to retain efficiency savings before they are passed through to the customer in the form of lower prices. In the case of opex an ex ante assessment of required opex is typically made by the regulator at the start of the price control period and an allowance is included for these costs in the price determination. If out-turn opex figures are lower than expected (from efficiency savings) these are only passed through to customers through a lower opex allowance at the next price control determination or at an agreed date (for example, five years after the point at which the efficiency saving is realised). This incentivises companies to realise efficiency savings as they can retain the savings against the ex ante allowance for a defined period. For new capex, most regulatory approaches involve an estimate of the efficient level of investment needed being made at the time of the price determination (the ex ante aspect) and incorporated into the RAB, so allowing a return on the investment and depreciation to be earned. At the next price determination or at an agreed date after the investment takes place (again, five years have typically be adopted) an ex-post review occurs. This typically has the ex-ante investment figures that were incorporated in the RAB replaced with the out-turn figures. The timing of the ex post review influences the retention period of any efficiency savings against the ex ante allowance and therefore determines the strength of the incentive for the company to realise capex efficiency savings. When investment has been delivered more efficiently than planned, the new lower value is incorporated into the RAB. If investment has proven more expensive than planned then, unless a company can prove that the cause of the cost increase was outside its control, it is penalised by not being allowed to increase the value of the RAB for the difference between the ex ante and ex post values. Some of the reforms to UK regulatory regimes have relaxed this inefficiency penalty and allow some of the additional cost to be passed on to consumers through an increase in the RAB.

Source: CEPA analysis of Alexander and Harris (2005)

Separate treatment of opex and new capex and the possible bias it introduces to company decisions – created both through the approach to efficiency assessment and the incentive mechanisms/strengths – has led to significant attention in the UK on possible solutions.

The aspect of incentive mechanism and/or strength has been addressed through the creation of menus that cover both opex and capex and/or the equalisation of incentive rates.[4]

With respect to efficiency assessment, the UK has focused on moving away from separate analysis of opex and new capex with a move to totex (total expenditure) – something Ofgem did for the RIIO-T1 and GD1 determinations and which Ofwat is investigating for its next determination, PR13.[5] As noted above, the argument for moving away from individual efficiency assessments for opex and new capex is to counter the perceived investment/capital bias that has existed. To date, the separate assessment of the efficiency of new capex has proven more difficult than assessing the efficiency of opex proposals and this has been one of the contributing factors to the capex bias

[4] See for example the discussion in CEPA August 2012 Incentives and Menus, prepared for Ofwat as part of its consultation for the PR13 price determination.

[5] See for example, Ofgem December 2012 'RIIO-GD1: Final Proposals' and 'RIIO-T1: Final Proposals' and Ofwat January 2013 'Setting price controls for 2015-20 – framework and approach'

Different approaches to estimating efficiency in opex or new capex can lead to further perceptions that one type of expenditure is more difficult to assess than another and consequently that type of expenditure is likely to be more easily approved. A single unified approach to assessing totex helps address these problems..

It should be noted, that even under a totex approach where both opex and capex are adjusted for efficiency, any such adjustment is only applied to new capex (rather than total costs where existing and new capex is addressed implicitly through depreciation and return).

2.2. The model of incentive regulation and its accounting framework

Given the objectives of incentive regulation, the three principal requirements for the basic model of financial regulation of monopoly businesses follow quite logically:

- allowable revenue is cost-driven;
- allowable revenue incorporates a normal rate of return reflecting the cost of capital; and
- allowance revenue is based on regulatory forecasts.

The objective of controls is to allow a reasonably efficient company to meet its annual operating costs (opex), the depreciation of its assets and to finance its capital expenditure (capex) by way of a return on capital employed. The allowed return is on the net asset base, i.e. capex less related depreciation (i.e. the return of investment)[6].

The supporting accounting framework for incentive regulation then has to take account of many interrelated factors. These include:

- asset valuation (i.e., which fixed assets are deemed to be recoverable and eligible for earning a rate of return, and the basis for their valuation (historic, indexed or replacement cost)?);
- the depreciation profile (i.e., what annual charges to the profit and loss account for the writing down of the asset values are appropriate?);
- the effects of inflation; and
- the treatment of financial issues such as the valuation of the opening RAB.[7] This includes the assumed asset life for depreciation, how the initial opening value is re-valued and how any disposals (if allowed) might be treated.

As regards the valuation of the opening RAB, different sectors and countries have adopted very different approaches to this issue.

[6] We understand that the system in the Netherlands is a little different inasmuch as new capex/investment is not incorporated into the RAB during the price control period but only afterwards. This does not change the overall thrust of the arguments and is something that is under discussion in the Netherlands.

[7] See CRI Research Report (1998): 'Accounting Requirements for Regulated Industries'

For example, in the UK energy and water and sewage sectors, the RAB at privatization was discounted significantly relative to the estimated replacement cost of the assets, with the opening RAB set on the basis of the offered share price at floatation. If privatisation had been on the basis of replacement cost asset values then prices charged to consumers would have been higher. The lower than replacement cost value at privatisation meant that the Government received less for the assets being sold but consumers only faced a gradual increase in prices to full replacement cost recovery – the price path was in excess of 20 or 30 years.

In the case of TenneT, we understand that an opening RAB was established based on the principle that the revenue for 1996 should be equal to the allowed revenue of 2000. This was part of the wider rules established for TenneT's regulatory regime at the time of liberalisation (see text box below).

Box 2.2: TenneT regulatory rules

TenneT initial RAB valuation and incentive principles

The regulatory regime for TenneT was established when the business was liberalised and was determined by the DTe (the predecessor of the NMa). The initial RAB value for TenneT was calculated based on the principle that the allowed revenue for TenneT in the year 2000 should be equal to the revenue that was received by the transmission system operator in 1996. This was implied by the following formula:

(1) Revenue 2000 = WACC x opening RAB + Depreciation 2000 + OPEX

With the initial RAB value set equal to:

(2) Initial RAB = $\dfrac{\text{(Revenue 2000 -/- OPEX 2000)}}{\text{WACC + (depreciation 2000 / Opening Value 2000)}}$

This implied that the initial value of TenneT's RAB might differ from the actual book value but would be consistent with the principle allowed revenue in 2000 equalled revenue in 1996.

The DTe had decided not to apply an opening RAB valuation based:

- on a Modern Equivalent Asset (MEA) replacement cost valuation; or
- other similar replacement cost valuation principles.[8]

This was in order to prevent transmission tariffs from rising above the levels for 1996 but meant that TenneT's revenues were then expected to be lower than those in theory implied by a replacement cost valuation of the transmission assets.

When determining TenneT's initial RAB value, DTe had also noted in the document richt snoeren (this specified the rules of TenneT's regulatory regime) that TenneT should be able to make a return on both "old" and "new" assets, provided that new investments and opex were efficient. The richt snoeren introduced the concept of "old" and "new" assets, with the DTe noting that once "old" assets were fully depreciated, TenneT should be completely efficient (given assumptions of what was deemed to be efficient), as any assets that had not been fully depreciated would by that stage have been constructed under a regime of incentive regulation.

This illustrates that the principles of incentive regulation, and the concept of TenneT being able to earn a return on its initial RAB value, were at the heart of the regime established for TenneT at the time of business liberalisation.

Source: TenneT, DTE and CEPA analysis

[8] For example, Optimised Depreciated Replacement Cost (ODRC).

As was the case in the UK, TenneT's opening RAB value was established based on a regulatory principle agreed at the time. The initial RAB was established to reflect that capital had been committed to the sector, but that other considerations, including tariff levels and cost efficiency, would also need to be taken into account when establishing this initial RAB value. This calculation of the RAB provided the opportunity for considerations such as efficiency to be taken account of, before capital was deemed to be committed against that opening RAB value.

This concept of the RAB as a commitment device has helped to ensure a cost of capital for price regulated utilities that is typically much lower than would be derived at for a normal project finance contract. This is because investors value the certainty provided by the RAB and are willing to lend at lower rates than under other regimes, such as normal project finance. In a paper by the Centre on Regulation in Europe (2013) they note that regulatory regimes organised around a RAB are used by Moody's (an international rating agency) as a benchmark for Europe in terms of assessment of investment stability and predictability.[9]

2.3. Investor returns

Underlying much of incentive based regulation is the accounting concept of capital maintenance.[10] This can be applied in one of two ways:

- Financial capital maintenance (FCM) – in which the value of the funds invested into providing the service is protected;[11] and
- Operating capital maintenance (OCM) – in which the value of the assets required to deliver the existing level of service is protected.

Each of these approaches has been employed in different circumstances and has accounting implications. For example, FCM accounting requires the real return to investors, both in terms of income and capital changes, to be at least equal to the underlying real cost of capital. This has been achieved by regulators in part through the indexation of the RAB and consequently a focus on the allowed rate of return.

OCM accounting seeks to achieve the same outcome in terms of return to investors but allows the RAB to be re-valued as the real cost of assets required to deliver the service change. However, this is also linked with an additional depreciation charge which returns to investors the impact of the change in the underlying cost of the assets – leaving them no worse off.

Of course, this does not mean that the investor is guaranteed a full return. The concept is that an investor ought to be able to earn the required return given capital employed if it meets any appropriate opex and new capex efficiency targets being set for it. But, movements in the value of the existing assets should not affect the overall return being earned by investors if regulators wish to

[9] Centre on Regulation in Europe (2013): 'Regulatory stability and challenges of re-regulating – a CERRE study'

[10] See for example, Whittington, G (1994): 'Current Cost Accounting: Its role in Regulated Utilities', Fiscal Studies

[11] This is the standard approach to capital maintenance in regulation around the world.

create an environment which is conducive to low cost investment as investors will perceive the stability and low risk in the system.

The FCM approach at the heart of UK regulation has been tested several times through regulatory decisions to deviate from the approach and subsequent appeals.[12] The three main tests of the ex ante / ex post approach that have arisen are summarised in boxes 2.3, 2.4 and 2.5 below and the decisions taken by the appeal body have upheld the basic concepts of no additional ex post adjustment on the grounds of efficiency for investment incorporated into the RAB in previous regulatory periods. The Monopolies and Mergers Commission (MMC) inquiry into the price regulation of British Gas was a particularly landmark case of the application of key financial and accounting principles in support of incentive regulation.

Boxes 2.3: MMC 1997 review of British Gas and appeals against ex ante / ex post approach

MMC 1997 review of British Gas
In 1993, the Monopolies and Mergers Commission (MMC) conducted an inquiry into British Gas, following their privatisation in 1987. In the case of British Gas, the Market to Asset Ratio (MAR) at the time of the sale was 0.4 (i.e. the amount paid represented 40% of the assets of the company). The current cost accounting (CCA) approach is in this case, equivalent to the value of the assets. At the time of the MMC inquiry, the MAR had risen to 0.6. Paying a full CCA return on all assets would mean that the shareholders would recover a windfall gain at the expense of consumers. In their decision, the MMC determined that a full CCA return should be allowed on all new investment, including replacement investment. For existing assets, the value of the MAR ratio was taken as 0.6 and the rate of return was scaled by this figure. For new assets, the rate of return was estimated as being 6.5-7.5%, which translates to a rate of return of 4.0-4.5% for existing assets after taking the MAR figure into account. Whilst one option for treating depreciation would be to scale depreciation by the MAR, the MMC allowed straight line depreciation on the full CCA-based RAB. By scaling depreciation returns, the shareholders would not receive additional cashflows above which they had paid for. However, since depreciation is an important source of cash-flow to fund new investment, the full value was allowed. The MMC approach allowed a greater cashflow amount to be recovered from depreciation, which in turn has the effect of increasing the effective MAR ratio to unity once the asset life has concluded as more of the RAB is being depreciated each year than would otherwise be the case. Effectively the MMC's approach created two RABs – a profit RAB and a depreciation RAB with the former initially set at 60% of the latter. The link between the two, the fact that the profit RAB was updated using the depreciation RAB values, ensured that investors did not receive any windfall through this decision.

Source: CEPA analysis of various sources

Boxes 2.4: NIE price review 1997

Northern Ireland Electricity 1997 price review
In the price control determination of Northern Ireland Electricity (NIE) in 1997, the regulator, Ofreg, sought to clawback investment that it deemed inefficient from NIE's RAB. There had been significant underspend on investment during the years of the price control and the company claimed

[12] Initially the appeal body was the Monopolies and Mergers Commission but this has now been replaced with the Competition Commission.

this was due to efficiency but could not substantiate the claim for the regulator.

A clawback which would have reduced the opening RAB for the next price control period was part of the decision that was referred to the MMC. Under the public interest obligation placed on the MMC they largely disagreed with Ofreg, but accepted that NIE themselves had admitted that some investment did not take place due to management focus being placed upon privatisation rather than due to efficient management decisions to defer/delay investment. This led to there being only one-third of the investment efficiency being clawed back, despite a regulator challenge of the MMC decision. Ofreg had initially (*following* the MMC's ruling) attempted to apply its full proposed clawback rather than the MMC's ruling but this was challenged by NIE in court. The court ruled that Ofreg was required to implement the MMC ruling in full, including its proposed clawback adjustment. The MMC and court ruling implied that this could be treated as an efficient deferral and set a high burden of proof for a regulator seeking to disallow investment.

Source: CEPA analysis of Alexander and Harris (2005)

Boxes 2.5: British Gas price review 2013

Phoenix Natural Gas Ltd 2013 price review
Phoenix Natural Gas Ltd (PNGL) is the owner and operator of the natural gas distribution network in Greater Belfast and Larne in Northern Ireland. PNGL rejected the 2012 determination made by the Northern Ireland Utility Regulator (NIAUR) and the Competition Commission (CC) issued a report on the determination. NIAUR had proposed a reduction in the Total Regulatory Value (TRV) of £75m for historic outperformance and deferred capex. This outperformance was in part because of the initial regulatory decision to allow only forecast new capex to be incorporated into the RAB, there was no ex ante ex post type regulation used elsewhere in the UK. In turn, this was in part because the gas system was being developed against an existing electricity network and sufficient incentives for the pipeline operator were required. Consumers overall would benefit because the use of gas would help reduce the peak load which in Northern Ireland which was driven by household consumption with the peak being early evening. Gas use would reduce this peak and so limit the need for expensive new peak serving electricity generation. PNGL felt that such a decision would have significant effects on investor confidence. The CC, again following a public interest obligation, agreed that the adjustment would have an effect and the overall effects would be significant. The rules framework had also set out that the forecast figures would be capitalised for PNGL, as the regulator tried to introduce network competition. The CC ruled that the pre-agreed rules must be stuck to.

Source: CEPA analysis of CC decision

2.4. Static efficiency and Capital Maintenance

The application of static efficiency, often referred to as "catch-up" or relative efficiency can have an impact on the returns earned by an investor. As noted above, not meeting efficiency targets would likely lead to an investor not earning its required return.

Consider a model where total costs are given by the following equation:

$$TC = Opex + Depn + Return$$

Depreciation is calculated by:

$$Depn = \alpha RAB_{Depn}$$

Where α is the depreciation rate, based on the asset life and the depreciation profile (straight line etc). Return is calculated by:

$$Return = WACC \times RAB_{Return}$$

Note, it is not necessarily the case that $RAB_{Depn} = RAB_{Return}$.

Investors are expecting to earn:

$$Required\ Inv\ Return = Depn + \ (WACC \ \times RAB_{Return})$$

This obviously assumes that allowed opex and actual opex are the same.

Then, if static efficiency of rate μ is applied to total costs the following is found:

$$(1-\mu)TC = (1-\mu)Opex + (1-\mu)Depn + (1-\mu)Return$$

For the latter two elements this is effectively the same as adjusting RAB_{Depn} and RAB_{Return} by the static efficiency rate.

This means the return earned by the investor – assuming that the opex static efficiency is appropriate and can be met – is:

$$Earned\ Inv\ Return = (1-\mu)Depn + (1-\mu)(WACC \ \times RAB_{Return})$$

As can be seen, the application of static efficiency to depreciation and return reduces the earned investor return below the required investor return. While this type of risk may be faced in competitive markets, prices are set in a way to compensate investors for this risk. This can lead to more volatile prices and also requires some estimation of the likely movement in the value of existing assets. Adopting FCM based incentive regulation can bypass the volatility in prices and reduce the level of prices for consumers.

To encourage investment into the system, the earned return needs to be expected to be at least the required return. Yet, the application of static efficiency to total costs breaches that principle. A similar effect arises from the more focused approach of ex post efficiency referred to as "used and useful" tests. Box 2.6 below summarises the example of the Brazilian electricity distribution sector where such an approach was introduced without warning to the companies.

Box 2.6: Application of 'used and useful tests'

Brazilian electricity distribution sector
Electricity reform was initiated in 1995 and the federal agency ANEEL was created to regulate the sector in the following year. There was a law created which ruled out the use of inflationary indices to correct asset values, but in subsequent reviews, such as in 2001, there was disagreement between the regulator and the regulated entities as to the appropriate asset valuation methodology. ANEEL opted for a replacement cost based approach to asset valuation. This was adopted with the justification that the regulator isn't legally obliged to remunerate investors, only to ensure the financial and economic equilibrium of the concession. ANEEL modified the approach to add net new investment and adjust the value to reflect movements in the market price of assets. The regulator finally opted for a RAB approach based on the replacement value of assets. There was also a provision for the regulator to write off any investment that it deemed would not be

utilised or that was inefficient. As the government's priority was to raise revenue at this time, the regulator disallowed revenue of these companies linked to the above book value sale price of the companies. This led to a period of underinvestment due to investor uncertainty and backlash from these companies. If investments are going to be "at risk" it is necessary for investors to know how the utilisation/inefficiency is to be established and how any disallowed costs are to be recovered. This was resolved in the second reform process, whereby clear rules and a method to reward companies in a different fashion were set out. Again, this is a risk that is faced in competitive sectors. Many investments do not get utilised. A company expects to earn its average WACC across all investments but any individual investment may make more or less than the average WACC. The risk of failed or failing projects means that the hurdle rate of return for any individual project has to be in excess of the WACC – this way successful projects will cover the cost of less successful projects. Regulation limits the expected return for any investment to the WACC and so does not provide automatic upside for failed or disallowed projects. This imposes a cost on investors and which can make encouraging investment into a sector difficult.

Source: CEPA

2.5. Summary

This section has discussed the theoretical principles which underlie incentive regulation focusing on the application of static efficiency and its links to key accounting and financial issues such as capital maintenance. The section which follows reviews the approach the NMa has in practice adopted for the application of a static efficiency adjustment to TenneT.

3. REGULATORY REGIME AND REVENUE FORMULA

3.1. Introduction

This section explains the regime applied by the NMa to set TenneT's regulatory controls and how efficiency adjustments are applied within the regime.

As set out in the introduction, an assessment of the 'accurate' static and dynamic efficiency adjustment and an assessment of the application of a dynamic efficiency adjustment is outside our terms of reference. However, an understanding of the NMa's approach to both static and dynamic efficiency is needed to take a view on the application of the static efficiency adjustment.

The subsections which follow review:

- the general regulatory approach and regime applied to TenneT as the single electricity TSO in the Netherlands;
- aspects of the formulas applied by the NMa to calculate TenneT's allowed revenues (including the efficiency adjustments within the calculation); and
- a discussion of the implications of the static 'catch-up' efficiency adjustment made by the NMa in calculating TenneT's allowed revenues.

3.2. Regulatory approach and regime

The revenues of TenneT are subject to *ex ante* regulation, as they are fixed in advance for a period of 3-5 years by the NMa, although the Electricity Act 1998 does provide for the possibility of correcting TenneT's tariffs under specific circumstances (i.e. *ex post* regulation).

Revenue surpluses and deficits resulting from differences between expected (*ex ante*) and realised (*ex post*) electricity transmission volumes are incorporated in tariffs of subsequent years. The NMa therefore uses revenue cap regulation for TenneT (as prescribed in the Dutch Electricity Act) and as such TenneT does not bear any volume risk for changes in outputs.

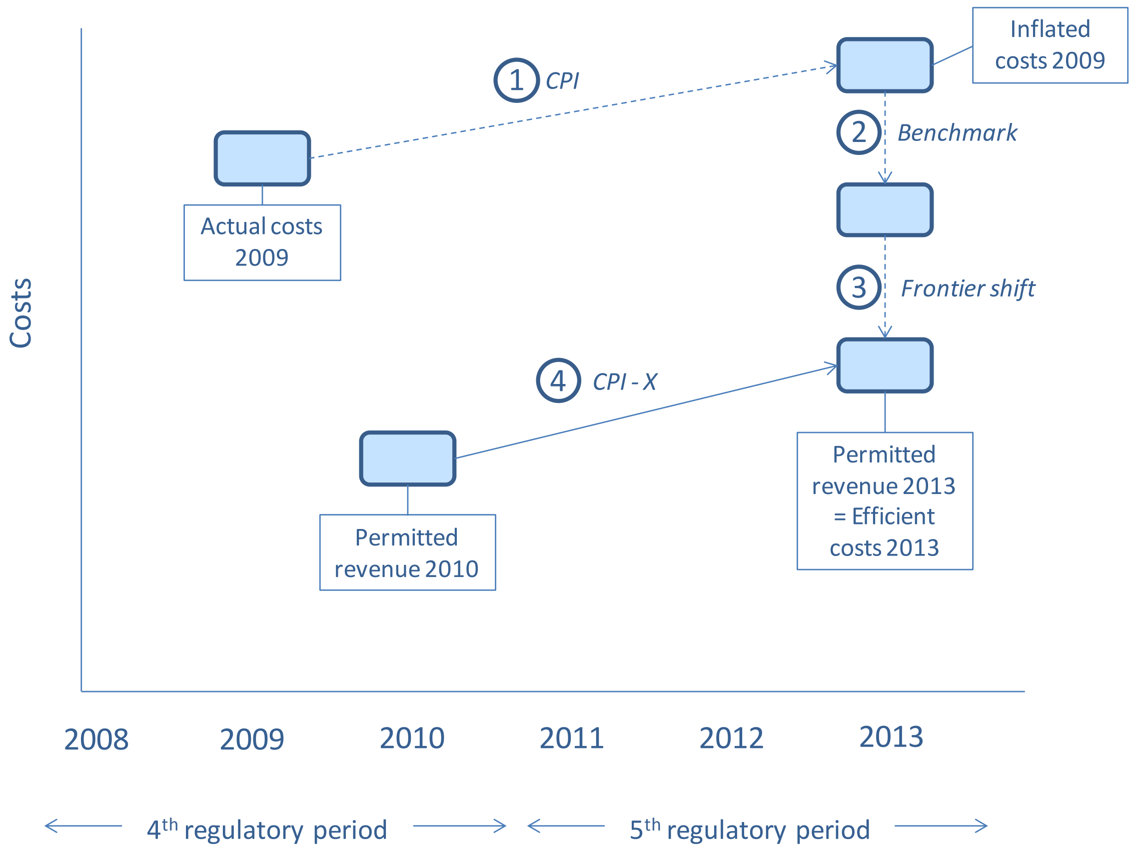
The revenue cap includes a mechanism for adjusting allowances if the NMa approves any additional capex during the price control. The legal formula also allows the NMa to set a 'catch-up' and 'frontier-shift' efficiency target within its calculation of allowed revenues.

For the 2011-2013 tariff period (i.e. the NMa have set a three year revenue control), differences between budgeted and realised (actual) amounts for certain categories of costs (e.g. purchases of emergency power and cross border tariffs (InterTSO compensation)) are adjusted for through tariffs in the subsequent year and are therefore treated outside of the ex ante incentive based control.

The core yearly revenue cap for TenneT is calculated on the basis of approved opex, new capex and profit and depreciation from the year 2009 and by applying both a static and dynamic efficiency adjustment (captured within an X-factor). This means that allowed revenues in theory cover only efficient costs as defined through the NMa's productivity and benchmarking analysis.

Figure 3.1 illustrates how actual costs in 2009, CPI and static and frontier shift efficiency adjustments are applied to determine efficient costs which are then used to determine the annual efficiency discount ("X") factor applied in TenneT's revenue formula.

Figure 3.1: The calculation of TenneT's allowed revenue for 2013



Source: TenneT and CEPA

Having set out the general regulatory framework and regime, we now review the key elements of TenneT's allowed revenue formula.

3.3. Formula for calculating allowed revenues[13]

The NMa apply a CPI-X based formula to calculate TenneT's allowed revenues. This is calculated according to equations below:

$$TI_t = TI_{t-1} \cdot (1 + cpi_t - x_p) \quad (1)$$

$$TI_{2011} = BI_{2010} \cdot (1 + cpi_{2011} - x_{2011,\ldots,2013}) \quad (2)$$

[13] The definition of terms in this section is based on CEPA's understanding and translation of the allowed revenue formula and its defined terms. This section should not be taken to imply an accurate translation of the definition of terms that are applied within NMa's determination.

$$TI_{2012} = TI_{2011} \cdot (1 + cpi_{2012} - x_{2011,\ldots,2013}) \quad (3)$$

$$TI_{2013} = TI_{2012} \cdot (1 + cpi_{2013} - x_{2011,\ldots,2013}) \quad (4)$$

Where:

TI_t is the allowed income for year t on the basis of the charges and volume parameters for year t for all tasks as specified under the Electricity Act;

BI_{2010} is the starting income for the year 2010 for the determination of the X-factor for the period 2011 to 2013 (adjusted for one-time settlements and the impact of new volume parameters); and

X_p is the discount factor applied to promote efficient operations from TenneT for the period p rounded to one decimal place.

3.3.1. Calculation of the X factor

The efficiency discount ("X") factor applied in the revenue formula is determined as follows:

$$EI_{2013} = TK_{2013} \quad (5)$$

$$TK_{2013} = TK_{2013}^{EHS} + TK_{2013}^{HS} \quad (6)$$

$$BI_{2010} \cdot (1 + CPI_{2011,\ldots,2013} - x_{2011,\ldots,2013})^3 = EI_{2013} \quad (7)$$

$$x_{2011,\ldots,2013} = 1 + CPI_{2011,\ldots,2013} - \left(\frac{EI_{2013}}{BI_{2010}}\right)^{1/3} \quad (8)$$

Where:

TK_{2013} is the total efficient cost for TenneT for all regulated transmission activities (including EHS and HS);

EI_{2013} is the Final Income for the year 2013 for the determination of the X-factor for the period 2011to 2013; and

$X_{2011,\ldots,2013}$ is the discount factor to promote efficient operations from TenneT for the years 2011 to with 2013.

3.3.2. Total efficient costs

Total efficient costs for EHS and HS Transportation activities are calculated separately within TenneT's allowed revenue formula.

We focus to begin with on the HS element, then highlighting the differences that apply to the definition of TenneT EHS total efficient cost.

For HS, the formula applied for total efficient cost is as follows:

$$TK_{2013}^{HS} = \left(KK_{2013}^{HS\,oud} + KK_{2013}^{HS\,neiuw} + OK_{2013}^{HS}\right) \cdot \theta \cdot (1-f)^4 + OK_{2013}^{HS\,E\&V} \quad (9)$$

Where:

TK_{2013}^{HS}	is the estimated total efficient cost for TenneT in the year 2013 for HS assets and activities.
$KK_{2013}^{HS\,oud}$	is the estimated capital costs in the year 2013 from historic investment in high-voltage grid to the year 2000 expressed in 2013 prices;
$KK_{2013}^{HS\,nieuw}$	is the estimated capital costs in the year 2013 from new investment in the high-voltage grid expressed in 2013;
OK_{2013}^{HS}	is the estimated operating costs for high-voltage grids in year t, exclusive of purchasing of energy and power;
θ_{HS}	is the Efficiency Parameter related to the capital cost of investing in HS assets and operational costs for the management of the high-voltage grids;
$(1-f)^4$	is the annual average 'frontier shift' adjustment of efficient costs for TenneT EHS and HS assets and activities; and
$OK_{2013}^{HS\,E\&V}$	is the operational costs associated with purchasing of energy, cross-border tariffs etc. which are excluded from both the 'static' and 'dynamic' efficiency adjustment.

EHS total efficient cost is calculated in the same way as for HS but allocates part of the total efficient cost to System tasks and functions (set at 40%).

Equation (9) shows that the NMa is able to apply a dynamic ('frontier shift') efficiency adjustment through the term $(1-f)^4$ to *total cost* (a combination of allowed opex, depreciation charges and returns) and a static efficiency adjustment through the theta term θ_{HS} (also applied to *total cost* (i.e. a combination of allowed opex, depreciation charges and returns)).

3.4. Application of the NMa's static efficiency adjustments

At the start of the current tariff regulatory period (2011-2013), TenneT's total costs for the EHV network were considered by the NMa to be 48% efficient, whereas total costs for HV network were deemed to be 100% efficient. This has meant that for the period 2011-2013, the NMa has decided to apply a static efficiency adjustment through the theta term of TenneT's calculation formula for total efficient cost of the EHV network.

The actual applied efficiency factor for the EHV network total costs however is 0.92. This parameter is derived from the efficiency score of 47% plus a 10% mark-up to account for uncertainties in the determination of TenneT's efficiency, as well as a mark-up of 34% resulting from the NMa's willingness to allow TenneT to make up its deemed efficiency backlog in the course of five regulation periods, i.e. a period of 15 years.[14]

[14] TenneT (2011): 'Prospectus dated 3 February 2011 for Euro Term Note programme'

4. ASSESSMENT

This section provides our assessment of the NMa approach and whether it meets the objectives of incentive regulation and the application of a static efficiency adjustment.

4.1. Assessment criteria

We have adopted the following criteria for our assessment:

- **Incentivisation of efficiency**: Does the application of a static efficiency adjustment incentivise efficiency from TenneT?
- **Capital maintenance**: Does the application of a static efficiency adjustment comply with concepts of financial capital maintenance?[15]
- **Regulatory simplicity**: Is the application of a static efficiency adjustment relatively simple for TenneT, investors and consumers to understand and implement?
- **Regulatory consistency**: Is the application of a static efficiency adjustment generally consistent with approaches adopted by regulators in other countries, such as the UK?

Broadly the criteria we have applied seek to ensure that the application of a static efficiency adjustment incentivises efficiency from TenneT (productive, allocative and dynamic) and allows for an efficient regulated company to finance its regulated activities given the cost of capital and assets which are employed within the business (hence the principle of capital maintenance).

We have also compared the different approaches to regulatory precedent of the application of static efficiency adjustments in other contexts and assessed the relative complexity of the approaches.

4.2. Options for applying static efficiency

Following the discussion in Sections 2 and 3, we have initially assessed the following approaches for the application of a static efficiency adjustment:

- **NMa approach**: where the 'static' efficiency adjustment is applied to total cost (i.e. opex, depreciation and returns).
- **Opex only approach**: where the 'static' efficiency adjustment is applied to opex but depreciation and returns are left unadjusted.
- **Opex and Depreciation approach**: where the 'static' efficiency adjustment is applied to opex and depreciation but not returns.
- **Efficient Totex approach**: where an ex ante allowance is set for totex and efficiency against this allowance is managed through regulatory incentive sharing factor(s).[16]

[15] We do not consider OCM an appropriate basis owing to the volatility in prices it causes. Further, the standard regulatory approach around the world is FCM – whether explicitly or implicitly.

Table 4.1 (overleaf) summarises our assessment of these options based on the application of our synthesised criteria. The key points to note are as follows:

- The NMa approach and the Opex and Depreciation approach would fail to meet the test of FCM or OCM. This is because the application of the static efficiency adjustment means that profits available for distribution to the company's shareholders, after having maintained the value of shareholders funds, are less than the required risk adjusted return for investing in the company (see discussion below).

- The NMa approach and the Opex and Depreciation approach at least in theory are able to incentivise and achieve productive efficiency in prices.[17] However, because these approaches limit the available returns to investors below required returns, neither approach is likely to be particularly conductive to an environment for low-cost investment and, therefore, the promotion of dynamic efficiency. This is because any new investment can prove to be value destroying for investors rather than enhancing.

- The Opex only approach can provide for capital maintenance as investors in the company have the capacity (assuming that the opex static efficiency adjustment is appropriate and can be met) to earn a normal (required) return on investment. However, by applying the adjustment only to opex, this approach fails against a key regulatory objective that there should be incentives for efficiency in totex.

- The Efficient Totex approach is the regime increasingly adopted in UK regulation for network industries such as gas and electricity and water and sewage. Efficiency is incentivised through a sharing factor (or factors) that apply to variations against an ex ante totex allowance for the price control period. Capital is maintained in the business as once capitalised expenditure goes into the RAB, investors receive a return of and on that asset base, meaning that provided the company is efficient, investors have the capacity to earn the required return on both past and future investment. It must be remembered that totex covers only opex and new capex, not the whole RAB.[18]

- The NMa, Opex only and Opex and Depreciation approaches are all relatively simple to implement once a static efficiency target is established for the business, although for reasons outlined above are inconsistent with general regulatory precedent and principles of incentive regulation. The Efficient totex based approach is complex to implement (particularly where applied through menu regulation) although because this deals with other regulatory issues, it has increasingly been applied in other contexts.

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[16] Companies are provided with an ex ante allowance for totex and then ex post variations around that allowance are shared between the companies and customers according to the agreed incentive sharing factor(s).

[17] As set out in the introduction, we have not been asked to establish whether the static efficiency adjustment applied by the NMa for TenneT is the 'correct' adjustment and therefore in practice achieves productive efficiency.

[18] The menu type systems now being applied in the UK mean that even some inefficient new capex could get included in the RAB since any overspend is shared between the company and consumers.

Table 4.1: Assessment of different approaches for the application of a static efficiency adjustment

Criteria	NMa approach	Opex only approach	Opex and Deprecation approach	Efficient totex based approach
Capital maintenance	Application of a static efficiency adjustment to total costs cannot provide for capital maintenance whether OCM or FCM if no further adjustments are made	Can provide for capital maintenance as investors have the capacity to earn a normal (required) return on investment	As for NMa approach	Can provide for capital maintenance as investors have the capacity to earn a normal (required) return on investment
Incentivisation of efficiency	May incentivise productive efficiency but may not incentivise dynamic efficiency where investment is value destroying for shareholders since any new investment may earn less than the WACC, and possibly even a negative return when disallowed costs are included	Would only allow NMa to incentivise efficiency of opex from TenneT	As for NMa approach	Incentivises totex efficiency; can also remove company bias to adopt opex or capex solutions through equalised efficiency incentives
Regulatory simplicity	Simple to implement once a static efficiency target is established for the business	As for NMa approach	As for NMa approach	Complex to implement – particularly if incentives are created through a menu of totex allowances
Regulatory consistency	Inconsistent with approach and principles adopted in UK, Australia and other countries, such as Ireland, Hong Kong, New Zealand etc, applying incentive regulation.	Has been applied in some cases but generally inconsistent with regimes for capital intensive network industries	As for NMa approach	Would be consistent with Ofgem RIIO price regulatory framework and Ofwat's proposed approach to cost efficiency incentives

Criteria	NMa approach	Opex only approach	Opex and Deprecation approach	Efficient totex based approach
Conclusions	Limits available returns to investors below required returns; therefore fails to sustain the capital invested in the business and is unlikely to be conducive to dynamic efficiency and low-cost investment as investors will increase the return they require to cover the perceived change or weakness in the regulatory contract	Achieves capital maintenance for the company but fails to achieve a key regulatory requirement of incentivising capex efficiency.	As for NMa approach, although as the efficiency adjustment is not applied to returns the impact is less material; however still inconsistent with core financial and economic principles of incentive regulation	Achieves the core regulatory objectives of providing for capital maintenance and incentivising efficiency; however this approach is inconsistent with the NMa's existing regime and is complex to implement

Source: CEPA

Why does the NMa approach and the Opex and Depreciation approach fail to achieve capital maintenance?

In order for capital maintenance to be realised in the regulated company's balance sheet, the company can only recognise a profit in its income account once the real value (i.e. the general purchasing power) in the case of FCM, of investor funds has been maintained.[19] Many hybrid systems exist where the initial opening RAB value was set using a different approach but then FCM was adopted for going forward. This is fully implementable if the initial opening value is treated as though it was an initial investment by the shareholders.

This means that where a static efficiency adjustment is applied by the regulator to *allowed* depreciation charges[20] on existing assets (for which capital was subscribed against the opening RAB value), then the company's *actual* earnings must first be used to maintain the capital invested in the business. The *actual* returns that can be recognised by the company through its income statement therefore would be limited below the required cost of capital, if only a "normal" rate of return on the RAB is allowed by the regulator through the revenue formula. We demonstrate this through illustrative modelling in Section 4.4.

What are the implications for future investment?

In both cases, if depreciation charges for the existing RAB do not cover actual invested capital, and no allowance is made for the impact of the risk of not receiving the return of invested capital through the WACC, new investment into the company, even where allowed (efficient) investment costs can be achieved by the regulated company, is potentially value destroying for investors, as the earnings from investment must first be used by the company to maintain the existing capital that is invested in the business. This is a potentially significant flaw in the regime which could disadvantage consumers in the long run as investors either charge higher returns or cease to invest at all in the sector.

In contrast, the Opex only and Efficient Totex approach are both able to achieve capital maintenance as they assume that a static efficiency adjustment are only applied to future costs, so that provided the company is efficient, the allowance for opex and the return of and on invested capital (past and future) will cover efficient costs.

4.3. Making static efficiency work

Having assessed different options for the application of static efficiency, we have gone on to assess the ways in which these different approaches could be made to be consistent with the concepts of capital maintenance.

There is only one way in which static efficiency applied to total costs (i.e. the NMa approach) can be made to work with capital maintenance. This is to adjust the allowed pre-static efficiency return

[19] If OCM had been adopted then the modern equivalent asset/replacement cost value has to be ensured.

[20] In the case of the NMa approach, the adjustment is also made to the return on investment.

upwards for the impact of static efficiency on depreciation and allowed return. In this case the pre-static efficiency return would need to be:

$$Pre - static\ efficiency\ Return = \frac{Return + \mu Depn}{(1-\mu)}$$

Where μ is the static efficiency rate.

Other ways in which static efficiency could be made to allow investors an opportunity to earn their required return include:

- just applying the static efficiency to opex and not total costs (with limitations for promoting capex efficiency discussed above); and
- applying the static efficiency according to the Opex and Depreciation approach, but then having a separate RAB_{Depn} and RAB_{Return} where the post-efficiency depreciation is used to update the RAB_{Return} – this then means that the RAB_{Return} would always have a minimum value equal to the static efficiency reduction to the RAB_{Depn}.[21]

Box 4.1 summarises the approach used for water regulation in England & Wales which is close to that outlined in the second bullet above.

Boxes 4.1: Regulatory asset base roll forward

England and Wales water and sewage sector
The initial RAB for the England and Wales water and sewage sector was determined from an adjusted stock market value at privatisation, using the valuation of each water company, including debt, averaged over the first 200 days after flotation in 1989. This is then rolled forward using RPI, but is subject to periodic asset valuations, using a Modern Equivalent Asset (MEA) approach. It is this MEA value that is used for current cost depreciation and this depreciation amount is deducted from the profit RAB each year, whilst capital expenditure is added. Repex is not added directly to the RAB, but compared with an infrastructure renewals charge and the difference is added or subtracted to the RAB each year – effectively a net repex investment figure.

Source: CEPA

Under the split RAB approach (see Appendix A) the adjustment to RAB_{Return} could be profiled in any number of ways to ensure that the net present value of the realised cash-flows achieve capital maintenance. However, the approach adopted will affect the speed of recovery of allowed revenue through the regulated tariff. The optimal approach to the RAB_{Return} adjustment is therefore likely to depend on company financeability considerations and what is considered practicable from a tariff profiling perspective.[22]

Of course the alternative would be to apply the Efficient Totex regime developed by UK regulators for energy and water and sewage networks. This would mean that no static efficiency adjustment is applied to depreciation and the allowed return on *past* investment, but that the ex ante allowance for

[21] This is discussed in more detail in Appendix A. The impact of always having a positive RAB_{Return} arises as the post-efficiency adjustment depreciation is smaller than the depreciation that would be generated from RAB_{Return}.

[22] We have illustrated the impact of different approaches through our illustrative modelling in Section 4.4.

future opex and capex would be set at the deemed efficient level, providing the opportunity for an efficient company to earn the required return by investors. Either the ex ante allowance for capitalised expenditure is simply included in the RAB (and reflected in allowed revenues over the life of the asset) or alternatively ex post variations against the allowance are shared between consumers and investors through an incentive sharing factor.

Given TenneT's regulatory regime, and the NMa's approach to applying the static efficiency adjustment, we have also assessed which approach is likely to be the simplest to implement given the current allowed revenue formula.

It is clear that:

- Adjusting the allowed pre-static efficiency return upwards for the impact of static efficiency on depreciation and allowed return is likely to be the simplest approach as this can be applied within the existing revenue formula.
- In contrast, the approach involving a separate RAB_{Depn} and RAB_{Return} would be relatively complicated to implement, as it would involve much greater change to TenneT's existing allowed revenue formula.
- From a regulatory perspective, the Efficient Totex approach is likely to be the most complicated to implement as the regime would need to be developed and tailored to the specific context and regulatory objectives for TenneT.

This section therefore shows that any of the options for applying static efficiency can in theory be made to work with the concept of capital maintenance. However, certain approaches are likely to be much more complex to implement, particularly given the NMa's existing approach to price regulation of TenneT. The different approaches will also impact on the speed of recovery of money from consumers in remunerating investment in the business.

4.4. Illustrative modelling

To illustrate the findings of our assessment, we have developed an illustrative model to demonstrate the ways in which a static efficiency adjustment could be applied, including the NMa's existing approach for TenneT.

The assumptions and approach that we have adopted in the illustrative model are outlined in Appendix B. Broadly the model applies a classic regulatory accounting approach to the calculation of allowed revenues with the outputs based on FCM and a current cost accounting basis (i.e. keeping purchasing power fixed after inflation). The model assumes that a static efficiency adjustment of 20% is applied from year 4 in the model.

The following scenarios were then developed and illustrated within the model:

- **No adjustment**: a scenario where no static efficiency adjustment is applied within the calculation of regulated allowed revenues.

- **Full cost adjustment**: a scenario where each of the total cost components will be multiplied by the static efficiency adjustment factor to determine total costs (i.e. the NMa approach).
- **Opex and Depreciation (O&D) adjustment**: this is the same as the case above, apart from the return not being adjusted by the static efficiency adjustment term.

To simplify the model outputs, we assume that efficient opex is equal to actual or achievable opex by the company (and so no static efficiency adjustment is applied to opex). In practice this may not be the case and would impact on investor returns.

In Table 4.2 we have summarised some of the cash-flow measures for each of the scenarios. Appendix B illustrates these results in more detail.

Table 4.2: Model results

Element	No adjustment	Full cost adjustment	O&D adjustment	Partial adjustment
Full life allowed rate of return	5.0%	5.0%	5.0%	5.0%
Full life actual rate of return	5.0%	3.2%	4.1%	5.0%
Full life NPV of cash-flows	1,847	1,689	1,775	1,823

Source: CEPA

Note: the NPV figures are over the 40 year asset life, leading to the difference between the no adjustment and partial adjustment cases. If the NPV were to be modelled over the full life of the cashflows, these figures would be equal, it is just the profiling of the cash flows which is different.

Table 4.2 shows that the scenario where no efficiency adjustment is applied achieves the principle of FCM (as the allowed return is equal to actual returns). However the **Full cost adjustment** approach and the **O&D adjustment** approach both fail to meet the test of FCM.

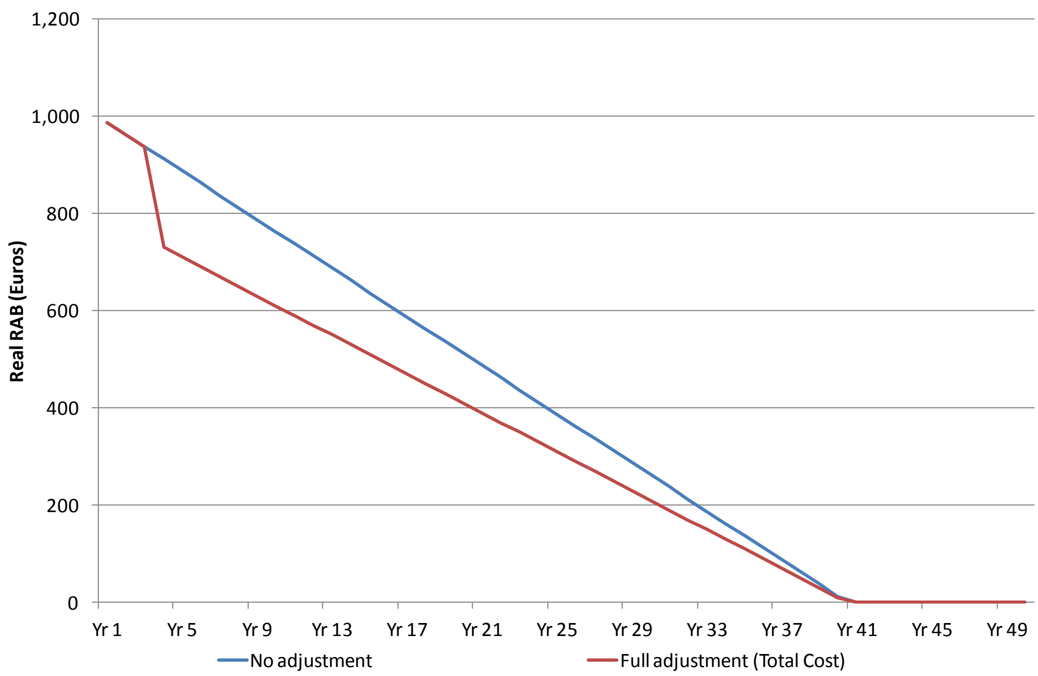
Figure 4.1 illustrates how under the **Full cost adjustment** approach of applying the 'static' efficiency adjustment, that is to total costs, the adjustment effectively writes down the value of the company's RAB. This means that shareholders capital value (given the required returns from investing in the business) is also reduced.

Applying the separated RAB approach described above, we have then used the model to illustrate the adjustment to allowed returns that is required to achieve FCM under either the **Full cost adjustment** or **O&D adjustment approach**.

This effectively involves writing down the RAB_{Depn} from which depreciation charges are derived but increasing the RAB_{Return} from which the allowed return is calculated. As described in Appendix B, we have also modelled a **Partial cost adjustment** scenario where the depreciation figure is adjusted down based on the static efficiency adjustment factor, however, the effective RAB_{Return} is not adjusted by this term, although the adjusted depreciation factor is subtracted in each year.[23]

[23] See Appendix B for further discussion.

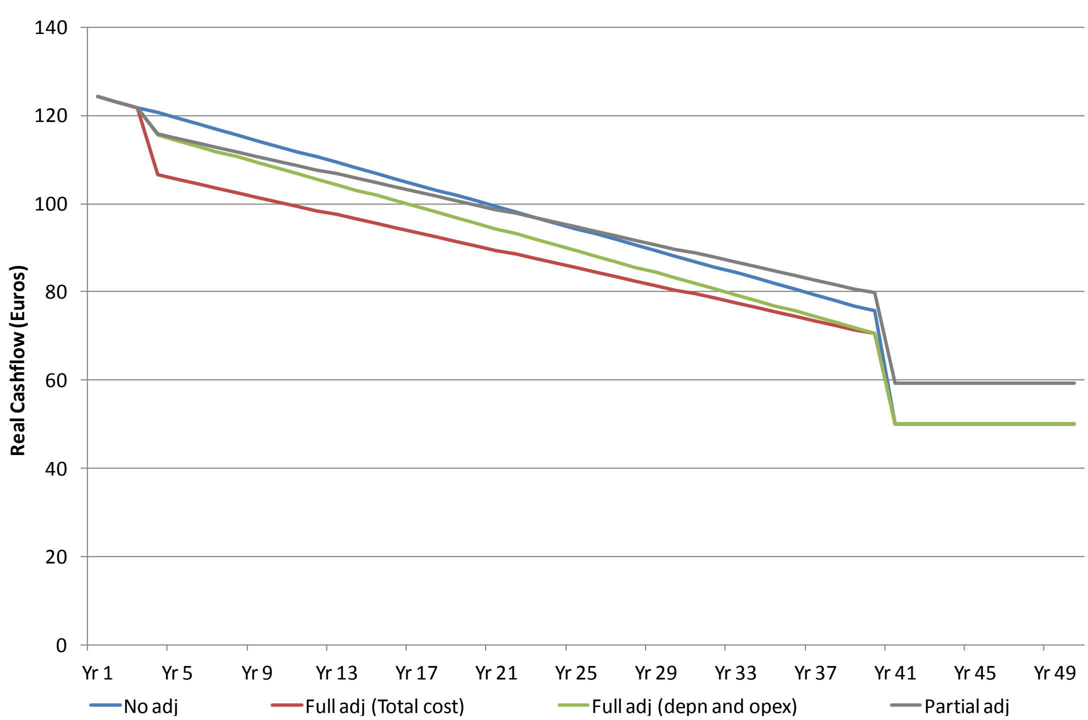
Figure 4.1: Effective RAB with a total cost adjustment



Source: CEPA

Figure 4.2 illustrates the cash-flow profiles under each of the scenarios.

Figure 4.2: Cash-flows under different options



Source: CEPA analysis

Figure 4.2 illustrates the point made in Section 4.3, that the adjustment to RAB_{Return} could be profiled in any number of ways to ensure that the net present value of the realised cash-flows are in theory able to achieve capital maintenance. However, the approach which is adopted will affect the speed of money recovery from customers through the regulated company's tariff. The greater the reliance on slow money (that is within the RAB) then the potential for financeability problems for a company is greater, especially if a period of above average investment is underway. This is because more money will need to be sourced from investors rather than met through the cash released through depreciation.

5. CONCLUSIONS

This report has considered the treatment of static efficiency by the NMa within the determination of the allowed revenue for TenneT. It has discussed how the framework of incentive based regulation is underpinned by a number of core economic, accounting and financial concepts, in particular, the principle of capital maintenance.

The concept of capital maintenance implies that an investor ought to be able to earn the required return given capital employed if it meets any appropriate efficiency targets being set for it. But, movements in the value of the assets should not affect the overall return being earned by investors if regulators wish to create an environment which is conducive to low-cost investment. A low-risk environment which supports low-cost investment will require clarity about the opening RAB, certainty about the allowed efficient level of new investment to be undertaken during the price control period, and certainty that the value of existing investments will not be reduced through the application of additional efficiency savings. Efficiency savings for the next price control period should be limited to savings for opex and new capex.

Our report analysis has demonstrated that the NMa's approach of applying a static efficiency adjustment to total costs (i.e. opex, depreciation and returns) if unadjusted for elsewhere within TenneT's revenue formula fails to meet the test of capital maintenance and other core regulatory principles applied in incentive regulation. Therefore, the NMa's approach conflicts with a core principle and objective of incentive regulation and limits returns to investors below the required return. Further, it seems to breach the existing regulatory contract, a key implicit or explicit regulatory tool used to create certainty for shareholders and consumers and could threaten the cost of investment or possibly even the level of investment or both. This is a potentially significant flaw in the regulatory regime which could disadvantage consumers in the long run as investors either charge higher returns or cease to invest at all in the sector.

We have illustrated that there are a number of alternative approaches of applying a static efficiency adjustment which could allow for incentivisation of totex efficiency but would yield the theoretical correct required revenue (i.e. to ensure financeability and an appropriate return to shareholders). We have also discussed the implications of different approaches, for example, with regard to the speed of recovery of money through customer tariffs.

Our recommendation is that TenneT should seek to engage with the NMa on this issue and investigate the options we have proposed to allow efficiency to be incentivised from TenneT while also providing for capital maintenance of an efficient regulated company.

APPENDIX A: SEPARATING THE REGULATORY ASSET BASE

Suppose we have two RABs:

- RAB(D) which is the depreciation RAB; and
- RAB(R) which is the return RAB.

Also, let us define RAB(R) as:

$$RAB(R)_t = RAB(R)_{t-1} + Inv_t - \alpha RAB(D)_t$$

Where Inv is the gross investment and α is the depreciation rate.

This can be rewritten as:

$$RAB(R)_t = RAB(R)_{t-1} + Inv_t - Depn_t \text{ (1)}$$

Suppose the static efficiency rate, θ , is applied just to depreciation. Then the updating process becomes:

$$RAB(R)_t = RAB(R)_{t-1} + Inv_t - \theta Depn_t \text{ (2)}$$

Now, if $1 > \theta > 0$ then:

$$Depn_t > \theta Depn_t$$

And consequently:

$$(2) > (1)$$

So, if a static efficiency factor is just applied to RAB(D) and the updating process for RAB(R) uses the θDepn factor, then a higher return will be earned by the company, partly offsetting the static efficiency factor. Further, once the asset is fully depreciated, RAB(R) will be > 0 and consequently a positive return will be earned forever. The residual value of RAB(R) will be given by:

$$RAB(R)_{residual} = (1 - \theta) Gross\ RAB(D)$$

If θ can change over time then a slightly more complicated residual value would be found, but the concept remains the same.

To illustrate the effect of this approach, consider the following two figures which use the modelling described in section 4. In the first figure, A1.1, the effective RAB(R)s found under some different scenarios are illustrated. The scenarios are set out in table A1.1 below.

Table A1.1: Modelling options

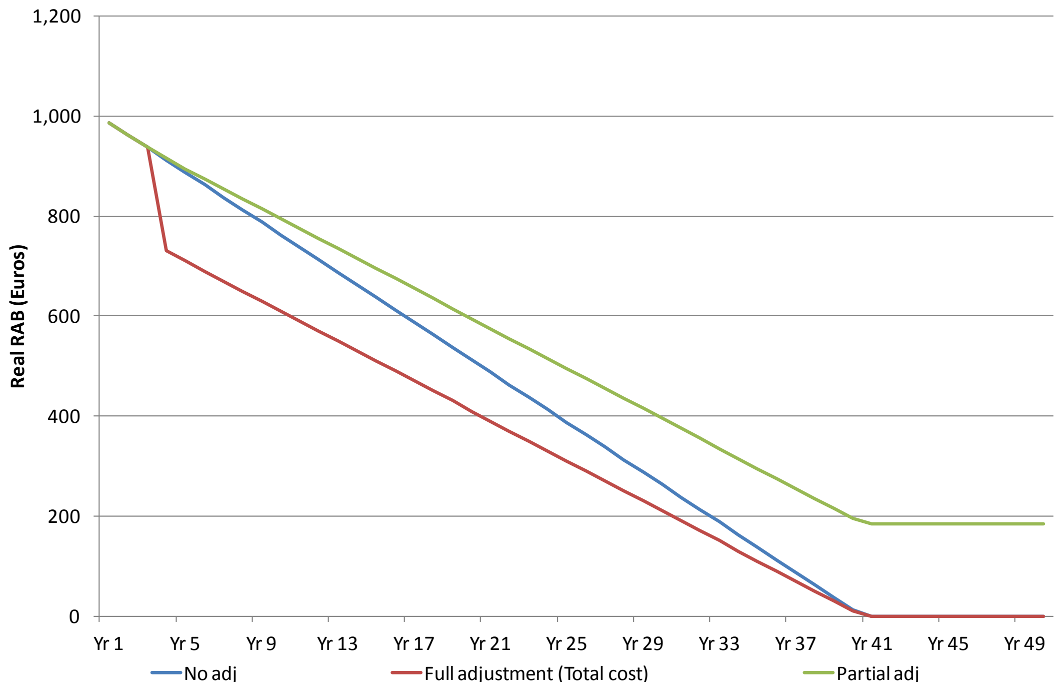
Case	Profit & Loss items				Balance sheet items
	Opex	**Depreciation**	**RAB return calc**	**Return**	**Effective RAB profile**
No adjustment	α	β	Uses an unadjusted RAB with β subtractions	γ	δ
Opex and Depn	θ α	θ β	*as above*	γ	θ δ
Total Costs	θ α	θ β	*as above*	θ γ	θ δ
Partial	θ α	θ β	Uses an unadjusted RAB with θ β subtractions	Based on RAB return calc	Based on RAB return calc

Source: CEPA analysis

α represents the amount of opex in each year
β represents straight line depreciation over an asset life
γ represents the cost of capital multiplied by the average RAB
δ represents the RAB profile in a case of no adjustment

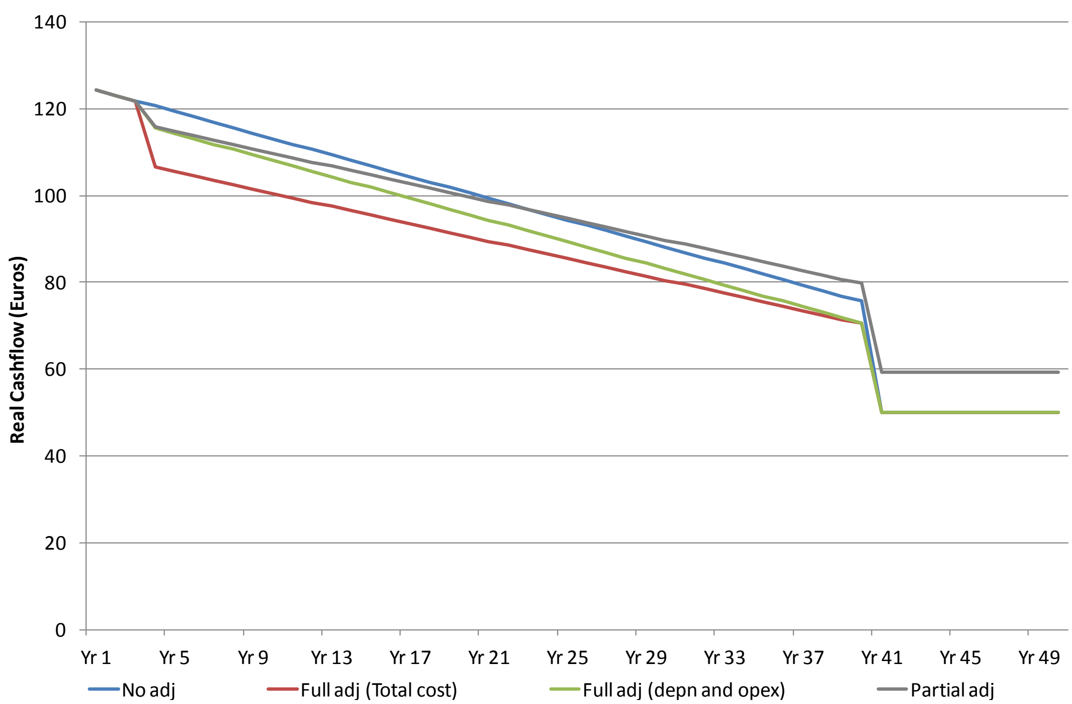
Note: The result of this analysis is that the only option with a residual RAB at the end of the asset life is the Partial case.

Figure A1.1: Effective RAB with partial adjustment approach (to be updated)



Source: CEPA analysis

Figure A1.2: Cash-flows under different scenarios



Source: CEPA analysis

As can be seen from the figures, the partial adjustment scenario, where the RAB is updated by the post-efficiency depreciation charge, delivers a residual RAB value as well as a higher cash-flow in the later years. This gives the same NPV as the original non-efficiency adjusted cash-flows but significantly changes the profile and the “speed” of the money – trading off “fast” money for “slow” money. Of course, the NPVs are only the same if the opex efficiency targets in the partial adjustment scenario are met!

APPENDIX B: ILLUSTRATIVE MODELLING FRAMEWORK

This appendix describes the approach and assumptions used for our illustrative model and provides more detail on the results provide in the main section of the report.

B.1. Assumptions

We have built a simplified model to illustrate the ways in which a static efficiency adjustment can be applied, including the NMa's existing approach for TenneT's allowed revenues.

This involves the following assumptions:

- asset life of 40 years with straight-line depreciation;
- initial investment of €1,000;
- cost of capital of 5.0%;
- a 20% static efficiency adjustment from Year 4;
- annual opex of €50, of which all is excluded[24] from the static efficiency ("theta") adjustment from Year 4; and
- no annual capex.

The model applies a classic regulatory accounting based approach to the calculation of regulated allowed revenues, which we have developed to be broadly consistent with the regime applied in reality by NMa for TenneT's regulatory control.

The outputs from the model are based on financial capital maintenance (FCM) and are on a current cost accounting basis (i.e. keeping purchasing power fixed after inflation).

B.2. Regulatory tests

By comparing the company's recognised profits and, therefore, return on capital employed, to the required (risk adjusted) return, the model is able to test whether the approach used to apply a 'static' efficiency adjustment within the calculation of allowed revenues complies with FCM.

B.3. Results

In each of the graphs below, the case with no adjustment will be shown as the base case, which is equivalent to what is expected by investors to ensure FCM.

In this simple case, there is depreciation of €25 each year (based on a €1,000 investment over 40 years), which is removed from the RAB, whilst a return is paid based on the average RAB and the

[24] Effectively the model assumes that that efficient opex is equal to actual or achieveable opex by the company (and so no static efficiency adjustment is applied to opex)

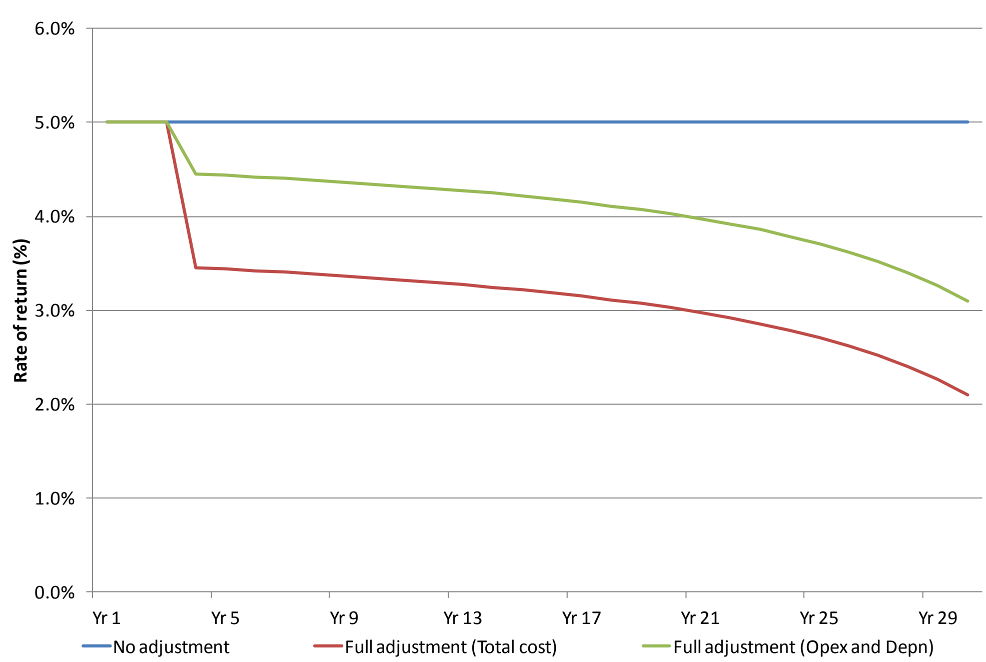
cost of capital. The cashflow paid to the company will be equal to the sum of return, depreciation and opex.

There are then three other scenarios illustrated within the modelling. These scenarios are:

1. Full cost adjustment (total cost) – each of the total cost components will be multiplied by the theta adjustment factor to determine total costs. The effective RAB can be thought of as the pre-adjustment RAB multiplied by one minus the theta adjustment rate.
2. Full cost adjustment (depreciation and opex) – this is the same as the case above, apart from the return not being adjusted by the theta adjustment term. This means that the adjustment will be between the no adjustment case and the full cost adjustment (total cost) case.
3. Partial cost adjustment – in this example, the depreciation figure is adjusted down based on the theta adjustment factor. The effective RAB though is not adjusted by this term, but the adjusted depreciation factor is subtracted in each year. The deduction of a smaller depreciation figure means that there is a residual RAB balance after the life of the asset concludes, on which a return can be earned. This approach should be identical in net present value (NPV) terms to the no adjustment case, but has relatively less cashflows in the early years of investment and greater cashflows beyond some point in time.

Figure B.1 shows the effective rate of return under the no adjustment and full adjustment cases. This is calculated as the remaining funds after deducting opex and depreciation from base case total costs, relative to the average RAB.

Figure B.1: Rate of return under different cases

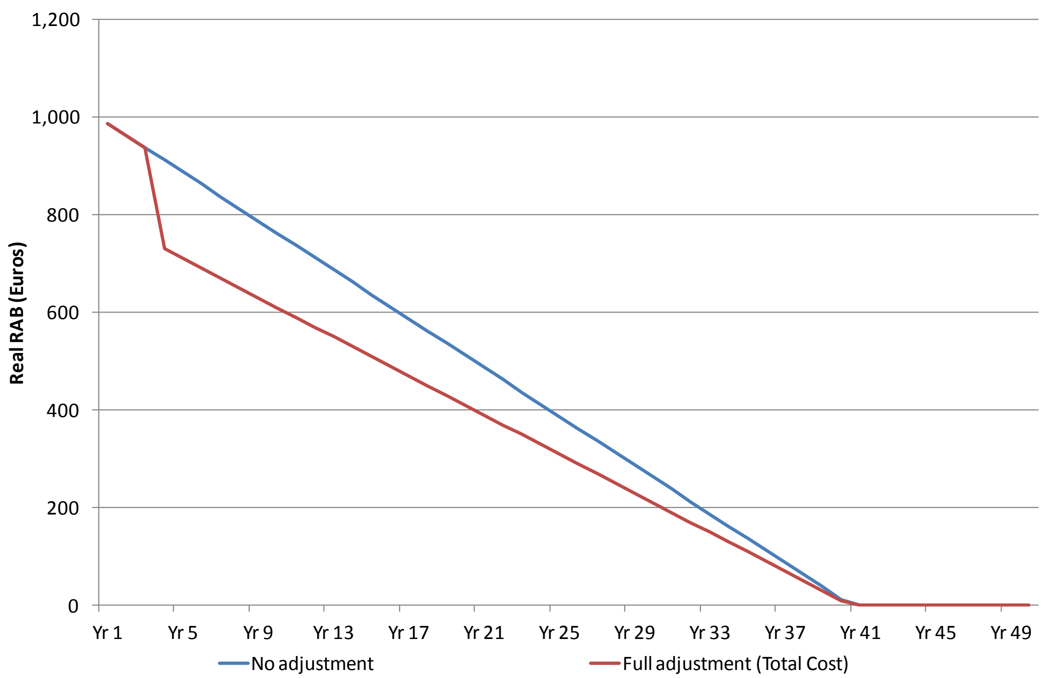


Source: CEPA analysis

The no adjustment case has a 5.0% return over the time period, while the full adjustment case for total cost shows a significant fall in the first year of the efficiency adjustment. There is a decreasing effective rate of return as the company cannot maintain their financial capital with the constant opex and depreciation amounts needing to be covered.

Figure B.2 shows how effective RAB when applying a full adjustment (total cost) approach. As the effective RAB is smaller, the size of the allowed return will also be smaller. The RABs eventually end up at the same point at the end of the asset life, but cashflows will differ.

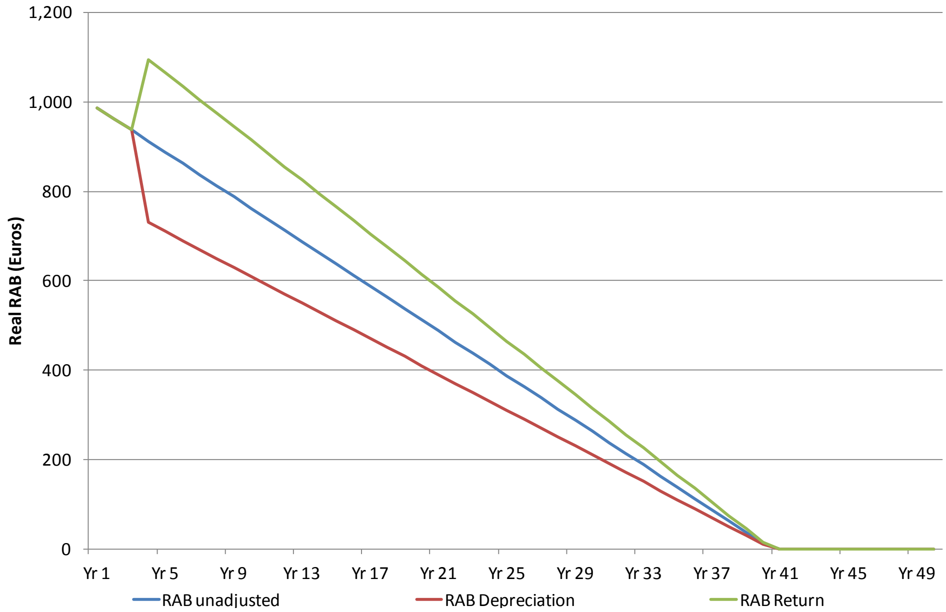
Figure B.2: Effective RAB with a total cost adjustment



Source: CEPA analysis

In order to maintain capital maintenance at the same point in time with our full adjustment (total cost) case as in our base case of no adjustment, an additional return is required. This could be done through the use of separate RABs for calculating depreciation and the return. Figure B.3 below shows how the RAB for allowed return would need to be higher.

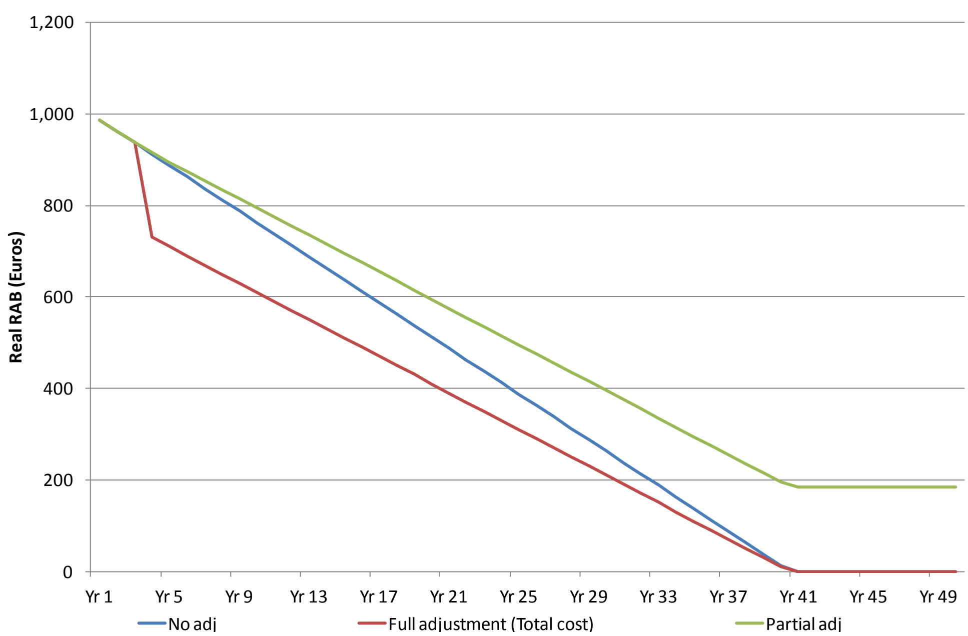
Figure B.3: Separate RABs for return and depreciation



Source: CEPA analysis

Figure B.4 shows how the effective RAB differs for the partial adjustment case. Under the partial adjustment case, as the amount of depreciation is smaller, despite lower cashflows in this respect, the effective RAB is actually higher after the adjustment as a smaller amount is being taken away each year. There is also the residual RAB balance at the end of the asset life.

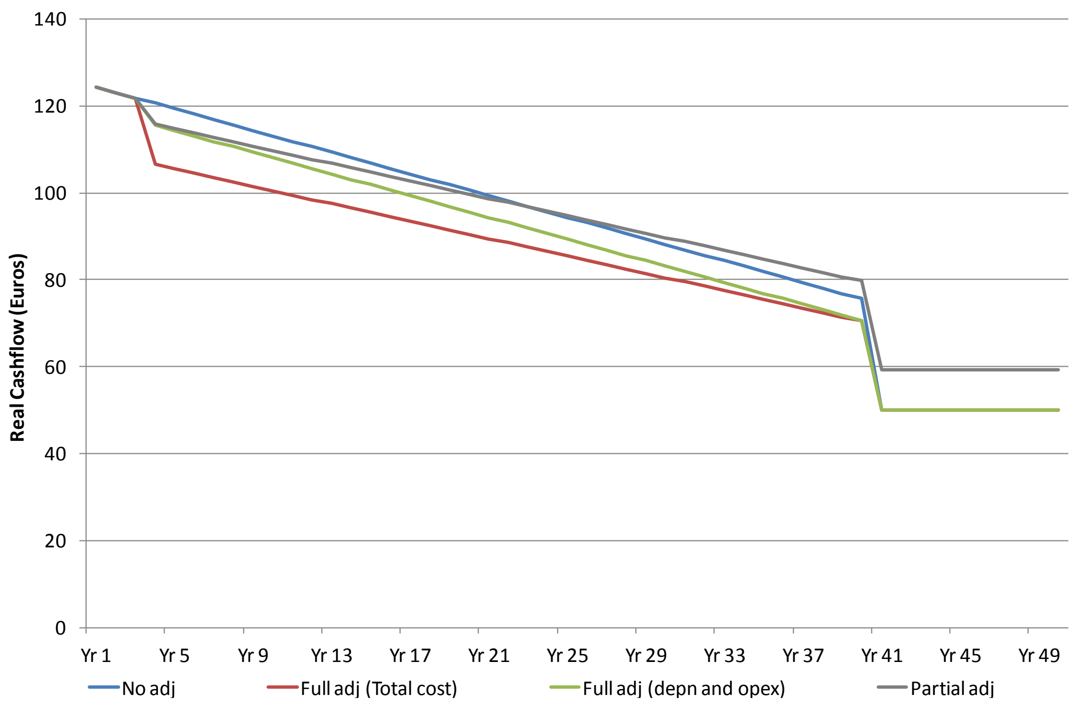
Figure B.4: Effective RAB with partial adjustment approach



Source: CEPA analysis. Note: The full adjustment (opex and depreciation) case follows the same effective RAB as the full adjustment (total cost) approach

In terms of cashflows under the different scenarios, the smaller depreciation amount means a greater cashflow for the partial adjustment case relative to the base case of no adjustment. Gradually the increase in the effective RAB and its subsequent effect on the allowed return dominates the smaller depreciation amount and the cashflow becomes greater than the base case. The partial adjustment approach also leaves an allowed return on the residual RAB after the life of the asset (see Figure B5).

Figure B.5: Cashflows under different options



Source: CEPA analysis