OFGEM

RPI-X@20: PROVIDING FINANCEABILITY IN A FUTURE REGULATORY FRAMEWORK

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Final Report

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Submitted by:

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CEPA

IMPORTANT NOTICE

EXECUTIVE SUMMARY

Cambridge Economic Policy Associates (CEPA) has been contracted by Ofgem to provide support on issues linked with financeability as part of the broader RPI-X@20 review that the regulator is undertaking. Financeability is an important issue for Ofgem since it is required to ensure that companies are able to finance their functions. How Ofgem views financeability and how it responds to financeability is a key issue within the regulatory regime.

This focus on financeability should be seen in the context of energy sectors where over the past few years there has been an increasing focus on capex, partly to replace existing assets but also to meet the increasingly significant renewables agenda. Capex will continue to be important for the foreseeable future. As a proportion of the existing asset base capex has been increasing which has placed a strain on the cash flows of the sectors.

What is meant by financeability?

At the heart of the proposed changes signalled by Ofgem in its "Emerging Thinking" is the measure of financeability which has dominated many of the determinations in both the energy and other regulated sectors. Financeability is a relatively nebulous concept that regulators have been addressing in different ways although the 2006 Financing Networks paper did provide the basis for a more coordinated and coherent approach. A stylised interpretation of the approach adopted to financeability in most sectors would be:

> whether a company is able to fund its investment programme and meet basic financial ratio tests, based on the way credit rating agencies assess whether a company is investment grade, given the expected cash-flows generated by the regulatory price determination.

As such, credit ratings (and the financial ratios that underlie them) have been central to the assessment of regulatory tests for financeability. When a financeability test has been failed regulators have tended to respond by increasing the cash-flows that will be generated during the price control period, either in a net present value (NPV):

- neutral manner – such that consumers may pay more in the short-term but would then face lower prices in the future, this can be achieved through accelerated depreciation (used in the energy and airport sectors) or simple revenue advancement (proposed for the water sector in the 1990s); or
- positive manner – such that consumers pay more for the service than they would otherwise have done, this can be achieved through allowing an uplift on the WACC (as employed in the water sector in the 2004 determination – PR04).

Even when NPV neutral approaches are adopted there may be unintended consequences – for example, the most recent electricity distribution determination saw an increase in the proportion of assets that are subject to accelerated depreciation in part because the previous acceleration exacerbated the perceived cash-flow constraints as the capex programme grows. Further, when long lived assets are affected, as is the case with accelerated depreciation, there is a real possibility of significant inter-generational equity

issues arising. Existing consumers are paying higher prices and future consumers, in say 20 to 40 years, are paying lower prices than would otherwise have been the case. While these sort of price adjustments over a five or 10 year period may be expected to have a relatively small inter-generational impact, over this longer period a more significant impact can be expected.

One basic issue that needs to be considered is whether credit ratings are an appropriate test. While they are standard for competitive sectors infrastructure and utilities can be seen as being different. Further, recent high-profile errors or failures by credit rating agencies have attracted significant criticism – see for example the April 2010 report by the US Senate's Permanent Subcommittee on Investigations. While there clearly have been some issues with credit ratings we believe that when the full regulatory regime is understood they are more than able to evaluate the implications and provide appropriate ratings.

If the approach to ratings is appropriate but financeability tests are still failed why is this the case? Possible causes, which are not mutually exclusive, include:

- not setting an appropriate WACC;
- facing a short-term cash-flow mismatch between costs and revenues;
- a misunderstanding of the regulatory process by the credit rating agencies; and/or
- poor management and an expectation that an inability to meet the regulatory targets will occur.

Clearly the last of these issues is a management problem and something that owners of the companies would need to address, provided that the targets have not been set in an unachievable manner (which would be expected to lead to an appeal and consequently should not be a concern).

Our overall approach

What is of interest is how regulators and companies respond to these ratings. As noted above, to date the primary response to financeability problems has been bringing revenue forward and consequently making existing customers pay more than would otherwise be the case. This removes the financeability problem. However, that is not how a competitive market would operate. A consideration of other sectors shows that when major investments are called for it is often investors who provide the funds, including equity investors through rights issues when the investment is significant compared to the existing capital base. Even during the last year to 18 months there have been high-profile rights issues – for example, Prudential to pay for its East Asian expansion or 3i, the UK's biggest listed private equity group, raising over £700m in a rights issue to strengthen its balance sheet. In those cases it is not today's customer who is being asked to fund services that will primarily benefit future consumers. Table 1 provides some data on recent utility company equity issues.

Table 1: Evidence on equity issuances by utilities and associated companies

Company	Date	Amount (millions)	Stated purpose
Centrica	Dec 2008	£2,251	Funding of acquisitions
Scottish and Southern	Jan 2009	£479	Funding of capex programme
Envestra	Feb 2009	€87	Debt consolidation
Enel	Mar 2009	€8,000	Maintain credit rating
South East Water	Mar 2009	£39	Maintain covenanted ratios
Snam	May 2009	€3,470	Funding of acquisitions
Iberdrola	Jun 2009	€1,250	Maintain credit rating
Emerat	Jul 2009	€141	Debt consolidation

Source: Oxera and South East Water[1]

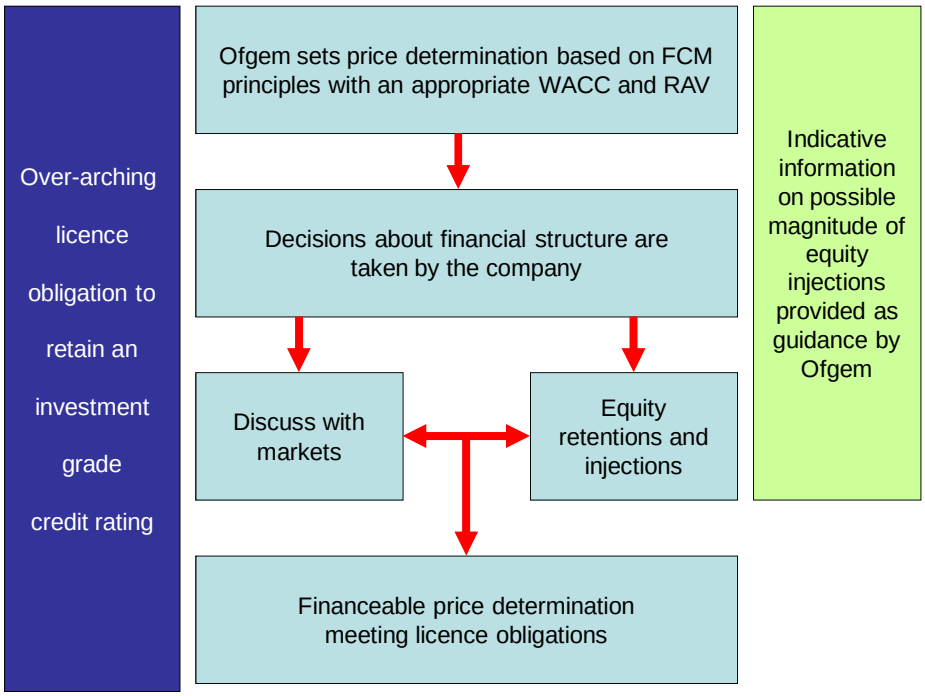
There are also existing UK regulatory precedents for this approach. Ofwat's recent PR09 determination proposed that three of the water companies would need to make equity injections. Ofgem has itself in the past suggested this – TCPR4 (incorporating TIRG) proposed equity injections when traditional revenue smoothing through accelerated depreciation was insufficient (although the solution to any problem was left to the management of the company). These approaches are more in line with the recommendations of the Financing Networks paper. Companies with significant financeability concerns were recommended to raise new equity as a way of addressing the problem rather than having consumers advance revenues. It is likely that this approach will be tested at the Competition Commission since one of the water companies faced with the need to raise new equity has appealed the determination.

The way in which this would be implemented is shown in Figure 1. Ofgem would determine the allowed revenue based on long-term principles enshrined within financial capital maintenance which include an appropriate allowed rate of return (WACC), depreciation, a regulatory asset value (RAV) etc. As part of this exercise Ofgem would consider the cash-flows associated with the determination against standard financeability ratios and come to an indicative view as to whether new equity would be needed during the price control period. This does place a greater emphasis on ensuring that Ofgem has got the approach to the building blocks right – this is discussed further below.

It would, however, be up to the management and owners of the company to decide how they would finance the determination. Several possible routes may exist for the company including:

[1] Oxera (September 2009) *"Updating the WACC for energy networks – Prepared for Energiekamer"* http://www.energiekamer.nl/images/Oxera%20-%20Updating%20the%20WACC%20for%20energy%20networks%20%E2%80%93%20Methodology%20paper%20%28concept%29_tcm7-133068.pdf
South East Water Limited (March 2009) "Regulatory Accounts Year ended 31 March 2009" http://www.southeastwater.co.uk/pls/apex/PROD.download_file?p_doc_id=151

Figure 1: Proposed approach



- cost cutting over and above that expected by the regulator as part of the determination;
- raising additional debt through working with the markets so that they better understand the long-term nature of the settlement and consequently are willing to accept financial ratios that might be lower than normally accepted;
- reducing or even stopping dividend payments for a period so that additional internally generated equity is available; and
- raising new external equity.

Whether one of these or a combination was used would depend on the viability of the options and the scale of the injection needed.

Providing an overall framework for this approach would be a continuation of the licence requirement for the operator to retain and investment grade credit rating. This should also ensure that the decisions about the WACC etc are provided with an appropriate long-term framework such that costs should not unduly escalate.

Evaluation criteria

When thinking about any possible changes it is necessary to consider either implicit or explicit evaluation criteria. Key criteria used in this report are:

- impact on consumers – what impact is there on existing and future consumers in terms of price levels, volatility etc;
- impact on incentives – what happens to the incentives for companies to make appropriate levels of timely investments;

- simplicity – simple rather than complex solutions are preferable; and
- ease of implementation – linked to the simplicity concept but also broader in terms of the implementations for the explicit and implicit costs of regulation.

The building blocks

The approach outlined above does place a greater emphasis on getting the input values for the building blocks "right." This includes:

- depreciation policy allowing full recovery of the assets cost over the economic/useful life of an asset and being realistic about the future lives (which could be especially important for elements of the gas distribution network);
- capitalisation should be appropriate such that no additional inter-generational equity issues arise but which is also supportive of a totex based approach to benchmarking and menu regulation;
- the WACC should reflect the underlying non-diversifiable risk characteristics of the business and be based on the best available approaches which would imply a continued use of CAPM supported by additional market information and general inputs from alternative approaches; and
- long-term views about the appropriate capital structure for the industries (but an acceptance that during any individual price control period there may be a significant deviation from that long-term value).

To ensure that the markets view a settlement incorporating these approaches as robust there may be a need to strengthen regulatory commitment. Investors already view the stability created by the approaches to the RAV etc as creating a great deal of regulatory credibility and commitment but if further commitment was needed there are examples available that include:

- greater commitment to future approaches and values; and
- longer-term determinations for elements of a price control.

One possibility linked to the latter point would be to introduce a fixed WACC for capex during a price control period for longer than that control, effectively creating a rolling weighted WACC. Longer-term approaches based on some of the rules around indexation could also be considered.

It is not clear to us that greater commitment is necessary. However, if it is, there are routes that could be used that would meet investor requirements.

Phased Implementation?

We are also aware that any proposed fundamental change to an element of the regulatory regime needs to be considered in terms of the speed of implementation. While it may be possible to establish an appropriate change to the regulatory regime which provides lower or less volatile prices for consumers in the long-term, if high short-term costs would be incurred through an immediate implementation of the approach then consideration of a phased implementation would be appropriate.

There are several possible reasons why a phased implementation, or one that is signalled with several years before implementation occurs, could be appropriate. These include:

- limiting uncertainty and consequently not increasing costs unnecessarily;
- providing time for the impact of previous regulatory determinations to be unwound; and/or
- providing time for existing investors to change their ownership without causing unnecessary windfall losses through fire sales.

Each of these may be possible in the energy sector. For example a sudden change in the approach to financeability could:

- increase the cost of accessing finance in the short-term as the markets learn about the new regime and test how it is being implemented;
- face a cash-flow precipice owing to the impact of accelerated depreciation and expensed investments; and
- lead to existing "income" investors wishing to reduce their ownership and "growth" investors taking up stronger positions.

Of course, there are benefits associated with a fast implementation in new policy. For example, it: (i) signals a clear commitment to the new policy; (ii) minimises any complexity that could arise from a phased implementation; and (iii) allows companies to raise equity at a time when it is needed. As such, the costs and benefits need to be weighed-up as part of a consideration of whether a transitional period is necessary and to establish how a transition might be handled.

One practical way of considering whether a transitional problem exists is to consider what would happen to key financial ratios for companies if the existing "correction" for financeability were to be unwound. Table 2 provides an indication of what might occur for the whole DNO sector if at DPCR6 the accelerated depreciation were to be unwound. Note, the information provided is based on an assumption about the future level of investment and the treatment of dividends and, as such, is indicative of what the sector might face. Further, while this reflects the position for the sector as a whole, individual companies may face a different situation depending on their own characteristics.

Table 2: Financial impact of depreciation policy[2]

Years	20 year depreciation		40 year depreciation	
	2016 -2020	**2021-25**	**2016 -2020**	**2021-25**
Total FFO	18,000	20,800	13,900	17,600
Average FFO / interest	3.99	4.17	2.70	2.43
Average gearing	58%	55%	63%	64%
Average PMICR	1.70	1.78	1.55	1.48

Depending on what level of ratio is perceived to be required (something discussed in the report) it is possible that were the sector to face these ratios action would be required – some of our modelling is based on FFO/interest of 3.0 or PMICR of 1.6. The question is whether the time until DPCR6 is sufficient for the financial markets to have adequately adjusted to the new regulatory regime?

Of course, prior to DCPR6 there are transmission and gas distribution reviews to be undertaken. Should the new policy be applied here? In part this would depend on a similar consideration of the practical implications – especially if the expensing of 50 percent of the iron mains replacement investment were to be phased out. This would also in part depend on the planned scale of investment – possibly more important for transmission than gas distribution. A further consideration is whether a couple of years is sufficient time to establish the new policy. Since transmission has in part already employed this approach it may not be perceived as such a significant step. Any views expressed on the speed by which Ofwat implemented this policy will also have a bearing on the decision of whether to allow a transition period that stretches beyond the next transmission and gas distribution price reviews.

If it is felt that sufficient time has not been provided for the new regime to be "bedded" down then Ofgem could consider providing a longer transition period – say to the end of DPCR6 and implementing a partial solution for DPCR6 and the full new regime from DPCR7. The partial solution could be:

- implementation of the shift in depreciation rates; and
- an NPV neutral short-term revenue advancement.

Alternatively, the shift in depreciation rates could be phased – say moving to 30 years for DPCR6 and 40 years thereafter. The precise solution should depend in part on a set of principles and in part a pragmatic assessment of the situation facing the sector – in terms of investment needs, financial market attitudes etc.

Overall, while it may be possible to make a fast move to the new approach given that it has been signalled in different ways, caution is appropriate. Consequently providing a transition period during which the longer-term move to the use of equity is signalled but short-term revenue advancement in an NPV manner is provided is appropriate. The aim

[2] Assumptions include a flat spending profile over the period and dividends being paid at five percent of equity RAV.

would be to unwind the revenue advancement within five to ten years as the new policy is implemented and so limit the inter-generational equity impact.

Summary

Regulation which is expected to mimic the operation of competitive markets has adopted an approach to financeability which places a major cost on today's consumers. In the energy sectors this has led to inter-generational equity concerns since the solution to financeability has been to halve the economic life of assets for depreciation in electricity distribution and transmission and to expense 50 percent of a significant capex programme in gas distribution. In a competitive market when funding is required for projects with strong business cases but additional debt would breach financial ratios there would be a call on equity investors. There is no reason why this approach cannot happen in the regulated sectors and has been used recently by Ofwat (and to an extent Ofgem at TCPR4).

If there are concerns about the credibility of the regulatory system which would lead to a higher cost of finance there are additional actions that can be taken to strengthen regulatory commitment. Given that a strong regime with a significant track record exists it is difficult to believe that insufficient commitment is perceived by the markets, but if that is the case Ofgem can take appropriate actions.

What is key is ensuring that the building blocks which ensure that the commitment to long-term financial capital maintenance is delivered are estimated appropriately. There are primarily incremental actions that Ofgem can take to strengthen its existing position.

CONTENTS

1. INTRODUCTION

Cambridge Economic Policy Associates (CEPA) has been contracted by Ofgem to provide support on issues linked with financeability as part of the broader RPI-X@20 review that the regulator is undertaking. Financeability is an important issue for Ofgem since it is required to ensure that companies are able to finance their functions. How Ofgem views financeability and how it responds to financeability is a key issue within the regulatory regime.

This focus on financeability should be seen in the context of energy sectors where over the past few years there has been an increasing focus on capex, partly to replace existing assets but also to meet the increasingly significant renewables agenda. Capex will continue to be important for the foreseeable future. As a proportion of the existing asset base capex has been increasing which has placed a strain on the cash flows of the sectors.

This draft report sets out our thinking to date on the issues raised in the terms of reference (ToR). These include:

- the role of credit rating agencies;
- an appropriate basis for setting depreciation charges;
- an appropriate basis for setting the allowed weighted average cost of capital (WACC);
- the role of gearing;
- approaches to capitalisation;
- calibrating incentives using the return on regulated equity (RORE) measure; and
- appropriate treatment of anticipatory investment.

These are important issues and Ofgem has already signalled its desire to move away from its existing approach towards a more long-term approach where companies are responsible for ensuring they are able to finance their functions.

1.1. What is meant by financeability?

At the heart of the proposed changes signalled by Ofgem is the measure of financeability which has dominated many of the determinations in both the energy and other regulated sectors. Financeability is a relatively nebulous concept that regulators have been addressing in different ways although the 2006 Financing Networks paper did provide the basis for a more coordinated and coherent approach. A stylised interpretation of the approach adopted to financeability in most sectors would be:

> whether a company is able to fund its investment programme and meet basic financial ratio tests, based on the way credit rating agencies assess whether a company is investment grade, given the expected cash-flows generated by the regulatory price determination.

As such, credit ratings (and the financial ratios that underlie them) have been central to the assessment of regulatory tests for financeability. The expected cash-flows generated by the

regulatory price determination. When a financeability test has been failed regulators have tended to respond by increasing the cash-flows that will be generated during the price control period, either in a net present value (NPV):

- neutral manner – such that consumers may pay more in the short-term but would then face lower prices in the future, this can be achieved through accelerated depreciation (used in the energy and airport sectors) or simple revenue advancement (proposed for the water sector in the 1990s); or
- positive manner – such that consumers pay more for the service than they would otherwise have done, this can be achieved through allowing an uplift on the WACC (as employed in the water sector in the 2004 determination – PR04).

Even when NPV neutral approaches are adopted there may be unintended consequences – for example, the most recent electricity distribution determination saw an increase in the proportion of assets that are subject to accelerated depreciation in part because the previous acceleration exacerbated the perceived cash-flow constraints as the capex programme grows. Further, when long lived assets are affected, as is the case with accelerated depreciation, there is a real possibility of significant inter-generational equity issues arising. Existing consumers are paying higher prices and future consumers, in say 20 to 40 years, are paying lower prices than would otherwise have been the case. While these sorts of price adjustments over a five or 10 year period may be expected to have a relatively small inter-generational impact, over this longer period a more significant impact can be expected.

Ofwat in its most recent determination, PR09, has adopted a different approach more in line with the recommendations of the Financing Networks paper. Companies with significant financeability concerns were recommended to raise new equity as a way of addressing the problem rather than having consumers advance revenues. It is likely that this approach will be tested at the Competition Commission since one of the companies faced with the need to raise new equity has appealed the determination.

1.2. Possible causes of a financeability problem

A key issue to consider in this report is why a financeability problem may arise. This is important since it affects the choice of appropriate regulatory response. Possible causes, which are not mutually exclusive, include:

- not setting an appropriate WACC;
- facing a short-term cash-flow mismatch between costs and revenues;
- a misunderstanding of the regulatory process by the credit rating agencies; and/or
- poor management and an expectation that an inability to meet the regulatory targets will occur.

Clearly the last of these issues is a management problem and something that owners of the companies would need to address, provided that the targets set are achievable (if they are not this would be expected to lead to an appeal and consequently should not be a concern).

What of the other three possible explanations? Each needs to be considered in turn with much of the initial parts of this paper concerned with whether credit rating agencies understand regulation and whether the way that the WACC is set is appropriate.

The fourth explanation, that of a timing mismatch, gets to the heart of the problem with the issue being whether the mismatch is a short- or long-term one. If a long-term mismatch exists then this would suggest that the underlying principles employed in UK regulation are inappropriate – financial capital maintenance as employed does not deliver sufficient long-term revenues to remunerate investments.[3] Again, provided the WACC is being set correctly this should not be a concern and is not a concern that has been raised. Rather, the mismatch is a short-term one which companies have been able to persuade regulators that it is their responsibility to address through adjustments to revenues rather than being something that the managers and owners of the companies should address within the overall regulatory framework. Provided that there is a mechanism for allowing managers and owners to address this problem, which there is through the use of equity injections, regulators ought to be able to focus on getting the overall framework right and leaving it to the companies as to how they manage short-term mismatches.

This is a theme which we will consider throughout this document.

1.3. Evaluation criteria

When thinking about any possible changes it is necessary to consider either implicit or explicit evaluation criteria. Key criteria used in this report are:

- impact on consumers – what impact is there on existing and future consumers in terms of price levels, volatility etc;
- impact on incentives – what happens to the incentives for companies to make appropriate levels of timely investments;
- simplicity – simple rather than complex solutions are preferable; and
- ease of implementation – linked to the simplicity concept but also broader in terms of the implementations for the explicit and implicit costs of regulation.

1.4. Implementation issues

We are also aware that any proposed fundamental change to an element of the regulatory regime needs to be considered in terms of the speed of implementation. While it may be possible to establish an appropriate change to the regulatory regime which provides lower or less volatile prices for consumers in the long-term, if high short-term costs would be incurred through an immediate implementation of the approach then consideration of a phased implementation would be appropriate.

[3] Financial capital maintenance is based on the idea that the real value of an investment will be remunerated. While not formally established in a legal manner the last 20 years of regulatory precedent has been built around this concept.

There are several possible reasons why a phased implementation or one that is signalled with several years before implementation occurs could be appropriate. These include:

- limiting uncertainty and consequently not increasing costs unnecessarily;
- providing time for the impact of previous regulatory determinations to be unwound; and/or
- providing time for existing investors to change their ownership without causing unnecessary windfall losses through effective fire sales.

Each of these may be possible in the energy sector. For example a sudden change in the approach to financeability could:

- increase the cost of accessing finance in the short-term as the markets learn about the new regime and test how it is being implemented;
- face a cash-flow precipice owing to the impact of accelerated depreciation and expensed investments; and
- lead to existing "income" investors wishing to reduce their ownership and "growth" investors taking up stronger positions.[4]

As such, it is necessary to consider whether a transitional period is necessary and to establish how a transition might be handled.

1.5. Report structure

The remainder of this report is structured as follows:

- Section 2 considers the role of credit rating agencies in the regulatory process;
- Section 3 sets put our proposed approach;
- Section 4 considers some issues linked to regulatory credibility;
- Section 5 investigates the appropriate approach to depreciation;
- Section 6 considers the linked issue of capitalisation;
- Section 7 considers high-level issues linked to the allowed rate of return including whether a differential approach to the WACC is appropriate;
- Section 8 addresses some detailed issues linked to the estimation of the WACC;
- Section 9 investigates specific issues arising linked to the question of anticipatory investment;
- Section 10 considers how incentives should be calibrated on an *ex ante* basis; and
- Section 11 investigates transition issues.

[4] We adopt quite a stylised approach to considering such investors since this would place the greatest test on what we are proposing.

A series of annexes provide supporting evidence on specific issues.

2. RATING AGENCIES AND THE REGULATORY PROCESS

This section addresses rating agencies and specifically their role in the regulatory finance framework. It considers the role they have played to date, why there might be concerns over this role and what an appropriate role for ratings agencies might be going forward.

Rating agencies can have an important influence on regulatory decisions as seen with the revenue advancement companies have been able to achieve in response to perceived financeability concerns. Rating agencies have come under a lot of criticism in recent years, and this has raised concerns that any influence they have may be unwarranted. This section addresses these issues.

We propose that the general requirement on network operators to maintain an investment grade rating is prudent. Ratings agencies have recently received a great deal of scrutiny on the back of some poor judgement leading up to the financial crises. However, with regard to regulated industries there is evidence to suggest that they understand the regulatory framework better than previously believed. It would be possible to replace the requirement for an investment grade rating, but would probably not be worthwhile in our view.

Having said that, we think that the policy of adjusting price control determinations to comply with rating agency policy should be abandoned. As discussed elsewhere in this paper, if there is a genuine financeability concern the appropriate response is for an equity injection to address this.

2.1. The role of rating agencies in regulation

Ofgem has a duty to allow companies to finance their activities – specifically:

> to have regard to the need to secure that licence holders are able to finance the activities which are the subject of obligations on them. (Ofgem January 2010 *Embedding financeability in a new regulatory framework*.)

There are a number of interpretations of that duty, but ensuring that companies are able to be awarded an investment grade credit rating is one way to be able to demonstrate that it has been discharged. An investment grade rating means that securities can be bought by the wide range of institutions whose mandates are restricted to bonds with such ratings.

There are two main ways in which rating agencies affect the regulation of network utilities:

- First, regulated utilities in a number of sectors, and the larger licensed electricity and gas network operators in particular, are required to maintain an investment grade credit rating as a condition of their licence.
- Second, the agency approach to rating debt has an influence on price control determinations. The financial projection for a particular revenue profile is tested, assuming a notional level of gearing, to see whether the utility would satisfy rating agency financial ratios consistent with an investment grade credit rating. If it does not, or it is assumed that it would not, then it has often been the case that an approach to raising revenues is taken other than raising the cost of capital (for example explicit revenue uplifts in the case of Ofwat, and increasing the capital charge in the case of Ofgem through accelerating the allowed depreciation).

Asking whether the approach to the use of rating agencies should change means addressing these two issues. The concern on the second issue clearly links to other issues discussed in this report, such as the rate of depreciation of the RAV.

2.2. Reasons for lack of confidence in rating agencies

There have been a number of high profile failures of rating agencies.

- Large high profile failures were not anticipated such as Enron, Lehman Brothers (Moody's rated the debt at A2 shortly before default), and AIG (Moody's rating for senior unsecured debt was confirmed at Aa3 shortly before the government bail-out).
- More significant even than these, though, were the high ratings awarded to a range of securities backed by subprime debt. The reliance placed on the markets by these ratings has been seen as a major contributor to the financial crisis (e.g. see commentary pp76-7 of Turner (2009)) [5].
- More recently there has been criticism over rating agency opinions of sovereign debt and the power that rating agencies appear to have to control events (for example comments made by ECB Council Members).
- The approach to ratings often appear to be backward looking and not responsive to events. For example, Fitch in its annual presentation on the year ahead discusses expected future rating activity (i.e. increasing or decreasing ratings). Shouldn't expected upgrades and downgrades be actioned immediately (which is the approach in equity research on recommendations).

Issues such as poor governance, poor management, opaque methodologies and conflicts of interest (the rating is paid for by the issuer of the security rather than users of the rating) are among the reasons cited for the perceived failure of the rating agencies. These failures have led to:

- legislation requiring more stringent regulation of agencies (EC(2009)[6]); and
- reduced reliance on rating agencies by a number of organisations. Announcements by the Bank of England that it will be conducting its own due diligence on the risk of certain securities announced recently is just one example of this.

They have also led to calls from some quarters for UK regulated utilities to abandon the use of credit rating agencies in the regulatory architecture. For example, a paper by Policy Exchange[7] argues that "the rating agencies should be removed from the regulatory architecture as far as possible, so that the market, not the regulators, determines the extent of the use of ratings ... for regulated industries, the effect of including an investment grade licence condition is to devolve and important element of the regulatory function to the rating agencies."

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[5] The Turner Review, A regulatory response to the global banking crisis. FSA. March 2009. Available at http://www.fsa.gov.uk/pubs/other/turner_review.pdf

[6] Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009 on credit rating agencies. Published in the Official Journal of 19 November 2009.

[7] Delivering a 21st Century Infrastructure for Britain. Dieter Helm, James Wardlaw, and Ben Caldecott. Policy Exchange, 2009. Available at www.policyexchange.org.

Perhaps of greatest concern, though, is that there is a risk that rating agency decisions for utilities may be based on inappropriate factors, or a misunderstanding of the nature of risks which companies face.

2.3. Ratings are a proxy for default risk

Ratings are a proxy for a measurement of default risk. The research process of the agencies leads to a judgement of the relative risk of a security in meeting interest payments and repayments over the life of that security. The opinions are of use to the markets, as it reduces the need for independent research (although of course larger houses will do their own due diligence). There is no judgement or indication about liquidity of a security, or the investment quality.

There is evidence that the quality of ratings for single name securities has been much better than that for structured credit. This has been argued, for example, in Turner's (2009) analysis of the financial crisis, and is supported by data on defaults since 1981. The data in the table below is from S&P, and similar analysis is available from the other rating agencies.

Utilities have shown far lower default rates than other industry groups. Moody's 10 year default rates for utilities are 1.5 percent, far lower than others (e.g. energy at 9.5 percent, retail at 19.7 percent, and transport at 13.5 percent) and in line with government related issues at 1.3 percent.[8] This is reflected in higher rated bonds for utility companies on average.

Table 2.1: S&P Cumulative corporate default rates, 1981-2009

Rating	Years after issue		
	5	10	15
AAA	0.39	0.82	1.14
AA	0.33	0.74	1.02
A	0.72	1.97	2.99
BBB	2.53	5.60	8.36
BB	9.51	17.45	21.57
B	22.30	30.82	35.74
CCC/C	48.05	53.41	57.25

Source: S&P[9]

2.4. Rating methodology

The methods of determining ratings used by the different agencies are similar but differ in their details. Essentially it is an elaborate scoring and weighting process:

- industries are assessed on the quality and stability of the regulatory regime, and scores attached;

[8] Moody's 2010. Corporate Default and Recovery Rates 1920-2009.

[9] S&P 2009 Annual Global Corporate Default Study and rating Transitions. S&P, March 17 2010. From Table 24, page 57.

- companies are rated on track record and stated strategy (such as willingness to enter into M&A which may affect credit quality);
- scores are also determined for financial data on gearing and coverage ratios;
- these factors are then weighted to construct an overall weighting; and
- finally, the credit analyst applies judgement to reflect other factors that may positively or negatively affect credit quality. For example, the protection afforded by covenants restricting ability of management to distribute cash could be a reason to strengthen a rating.

Much of this analysis appears to be qualitative, and even the quantitative analysis converts into a qualitative score which is then aggregated with other scores. However, the analysis does require a detailed investigation of the legal framework for the industry, track record of government and regulatory decisions, regulatory architecture and future developments, as well as a good understanding of regulatory developments. It is difficult to conclude that on the basis of the methodology the credit agencies do not understand the industry.

Moreover, the relative judgements made appear sensible. Enagas, Red Electrica, REN, Scottish Hydro Distribution for example have A2 ratings, above those companies where the financial structure is more stretched.

2.5. Case study: Phoenix gas

Phoenix gas is a gas distribution company in Northern Ireland, owned by a fund which is controlled by Terra Firma which is in turn controlled by Guy Hands. In November 2009 it issued £275m bonds due in 2017. These were rated by Moody's at Baa2. Its rating benefits from the underlying low business risk associated with gas distribution. Moody's, however, notes that it has weak cash flow generation, exacerbated by its need to expand.

Despite this weak cash flow generation, Phoenix gas has a Baa2 rating, which was recently confirmed. This is a relatively strong rating given the weak cash flow and highly leveraged financial structure, which makes the company reliant on future access to the financial markets.

The reason why the company was afforded a more attractive rating is the credit protection that is embedded in the debt covenants, including restricting distributions in the event of breaching financial ratios, and a charge over the shares of PNG supporting a ring fence arrangement.

While this rating is investment grade, it is still weaker than other network companies: CE Electric, Northern Gas Networks, Scotland Gas Networks, Southern Gas Networks, Wales and West, Western Power Distribution (South West), and Electricity North West are all rated Baa1.

2.6. Options for use of ratings

2.6.1. Investment grade credit rating as a licence condition

There are three options for controlling the financial structure of utilities:

- use the investment grade credit rating as a condition;

- Ofgem directly imposes limits on financial ratios; and
- no control of financial structure.

It is possible for companies to leave the financial structure of companies without regulatory control. This is done in other (non-regulated) sectors, and if, as a result, a company falls into difficulty, the market for corporate control will ensure that useful assets remain in use. In theory, this could work for utilities as well. However, the evidence is that without any restriction the asymmetry of incentives on management will encourage companies to adopt aggressive gearing thereby exposing customers to a high risk of company failure.

One mechanism for controlling financial structure would be for Ofgem directly to set limits to the financial ratios that companies could adopt. However, this would require Ofgem to justify the ratios chosen, thus requiring it to develop and maintain greater expertise on credit analysis. Decisions on these will need to be made in a transparent way, with appropriate consultation.

Using rating agencies:

- is an effective and cheap way to identify the limits to gearing;
- ensures that the debt of utilities can be held by a wide range of funds, many of which cannot buy non-investment grade paper;
- makes it more likely that financing will be available to companies when it is needed; and
- is consistent with Ofgem's duties to ensure that companies can finance themselves.

Although rating agencies may often be wrong, having an investment grade rating is a reasonable minimum condition.

2.6.2. Financeability uplifts

Energy networks have an opportunity to earn a reasonable rate of return which is set by the estimated WACC. This return will be earned over the life of the asset, with the time profile determined by the combination of the WACC and the depreciation profile used.

It is possible that even though a company can expect to earn the cost of capital over a price cap period, its revenue profile would lead it to breach rating agency ratio limits. This may even happen at the notional gearing. This signifies one or more of the following have occurred:

- the cost of capital is too low;
- the rating agency limits or other rating agency analysis are wrong; and/or
- equity needs to be injected, which would reduce gearing and increase interest cover ratios.

It leaves the market the job of finding the appropriate mix of funding (equity, debt, and hybrid securities). At a time when capex needs are low, and depreciation is high relative to the size of the asset base, financing needs may be met at or above the notional gearing level. When a large programme of capex is needed, a lower gearing will be needed to avoid concerns from the capital markets that a large programme may not be funded.

Maintaining lower gearing may require equity issuance. This could be straight equity, diluting existing shareholders. Alternatively, convertible bonds or other hybrid securities could sensibly be used. Companies may also find ways to enhance credit (without breaching the licence), and should be considered if it is cost effective.

If the cost of capital is set correctly, then – by definition – the capital markets will be willing to fund the investment through an appropriate combination of available securities. Focusing on the ratings of the credit agencies as a means to ensure financeability is unbalanced, over-playing the role that debt should play in the funding of companies.

2.6.3. Supplementing ratings

We have argued above that there are good reasons as to why a regulated company's gearing level (or indeed any company) might naturally fluctuate over time due its capex requirements and size of asset base such that its efficient level of financial leverage over the long term may differ substantially from that in the short term.

Equally, we have also argued that where genuine financeability concerns exist these should be addressed through adjustments to the balance of debt and equity capital used to finance the asset base.

This raises an important question – how is a regulator to know if there are genuine financeability concerns requiring additional equity to be employed? One option is to leave to the ratings agencies through investment grade ratings. We have, after all, posited that ratings agencies have a better understanding of the regulatory framework and implicit long-term compact inherent within that than many give them credit for.

However, our position remains that whilst an investment grade rating should continue to be a licence condition requirement, its primary purpose should be as a valuable source of information rather than as an end into itself.

While we believe the decision about how a possible financeability problem should be solved is for the management of the company, it could be helpful for Ofgem to provide indicative guidance on the scale of the problem, based on a set of transparent assumptions. This indicative guidance would need to use one or more key ratios to inform modelling – something we utilise later in this report.

3. PROPOSED OVERALL APPROACH

As noted earlier, to date the primary response to financeability problems has been bringing revenue forward and consequently making existing customers pay more than would otherwise be the case. This removes the financeability problem. However, that is not how a competitive market would operate. A consideration of other sectors shows that when major investments are called for it is often investors who provide the funds, including equity investors through rights issues when the investment is significant compared to the existing capital base. Even during the last year to 18 months there have been high-profile rights issues – for example, the announcement by Prudential to pay for its East Asian expansion or 3i, the UK's largest publicly listed private equity company, raising over £700m to strengthen its balance sheet. In those cases it is not today's customer who is being asked to fund services that will primarily benefit future consumers. Table 3.1 provides some general evidence on secondary issues of equity in the UK while Table 3.2 provides some data on recent utility company equity issues.

Table 3.1: Number and value of UK equity issuances (2000-2009)

	Initial public offerings		Secondary equity issues	
Year	**Number**	**Total value (£bn)**	**Number**	**Total value (£bn)**
2000	251	7.90	187	10.07
2001	93	7.09	128	12.76
2002	69	3.82	140	7.86
2003	64	3.28	110	3.78
2004	248	4.46	108	9.69
2005	321	10.57	199	10.29
2006	288	16.69	402	13.45
2007	228	16.68	577	17.49
2008	61	4.78	423	31.99
2009	15	1.26	498	40.71

Source: Bloomberg

As can be seen from Table 3.1, secondary issues can be as important as primary issues, although the average size may be different. Further, the evidence for 2008 and 2009 suggests that many companies have accessed the secondary market for new capital, presumably primarily as part of a financial restructuring, while few companies have been willing or able to access the primary market.

Table 3.2: Evidence on equity issuances by utilities and associated companies

Company	Date	Amount (millions)	Stated purpose
Centrica	Dec 2008	£2,251	Funding of acquisitions
Scottish and Southern	Jan 2009	£479	Funding of capex programme
Envestra	Feb 2009	€87	Debt consolidation
Enel	Mar 2009	€8,000	Maintain credit rating
South East Water	Mar 2009	£39	Maintain covenanted ratios
Snam	May 2009	€3,470	Funding of acquisitions
Iberdrola	Jun 2009	€1,250	Maintain credit rating
Emerat	Jul 2009	€141	Debt consolidation

Source: Oxera and South East Water[10]

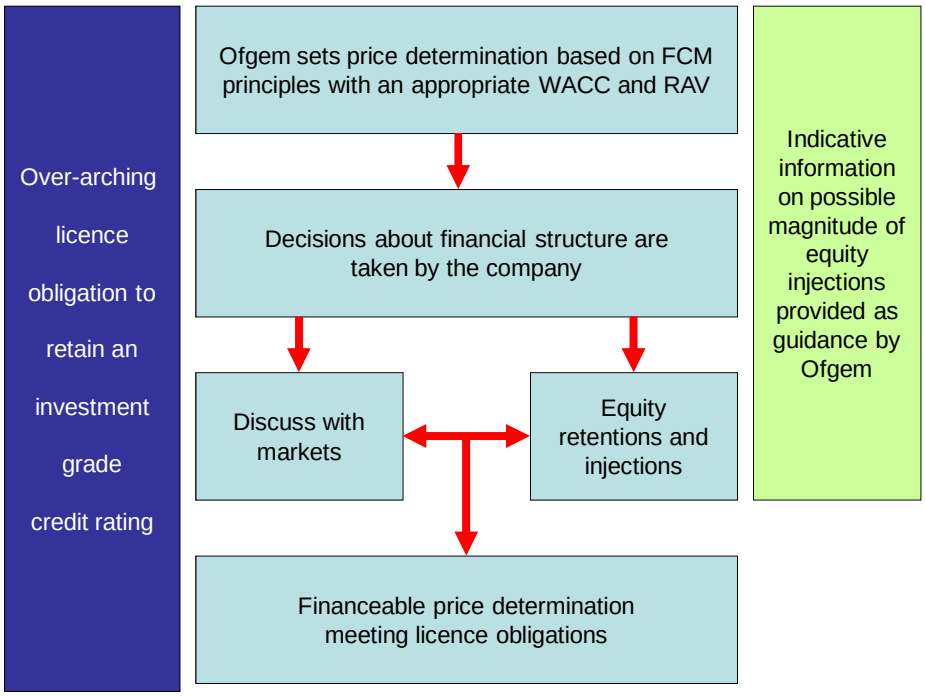
There are also existing UK regulatory precedents for this approach. Ofwat's recent PR09 determination proposed that three of the water companies would need to make equity injections. Ofgem has itself in the past suggested this – TCPR4 (incorporating TIRG) proposed equity injections when traditional revenue smoothing through accelerated depreciation was insufficient (although the solution to any problem was left to the management of the company). These approaches are more in line with the recommendations of the Financing Networks paper. Companies with significant financeability concerns were recommended to raise new equity as a way of addressing the problem rather than having consumers advance revenues. It is likely that this approach will be tested at the Competition Commission since one of the water companies faced with the need to raise new equity has appealed the determination.

The way in which this would be implemented is shown in Figure 3.1. Ofgem would determine the allowed revenue based on long-term principles enshrined within financial capital maintenance which include an appropriate WACC, depreciation, a regulatory asset value (RAV) etc. As part of this exercise Ofgem would consider the cash-flows associated with the determination against a small number of standard financeability ratios and come to an indicative view as to whether new equity would be needed during the price control period. Of course, this approach does place a greater emphasis on ensuring that Ofgem has got the building blocks right – this is discussed further below.

It would, however, be up to the management and owners of the company to decide how they would finance the determination. Several possible routes may exist for the company including:

[10] Oxera (September 2009) *"Updating the WACC for energy networks – Prepared for Energiekamer"* http://www.energiekamer.nl/images/Oxera%20-%20Updating%20the%20WACC%20for%20energy%20networks%20%E2%80%93%20Methodology%20paper%20%28concept%29_tcm7-133068.pdf
South East Water Limited (March 2009) "Regulatory Accounts Year ended 31 March 2009" http://www.southeastwater.co.uk/pls/apex/PROD.download_file?p_doc_id=151

Figure 3.1: Proposed approach



- cost cutting over and above that expected by the regulator as part of the determination;
- raising additional debt through working with the markets so that they better understand the long-term nature of the settlement and consequently are willing to accept financial ratios that might be lower than normally accepted;
- reducing or even stopping dividend payments for a period so that additional internally generated equity is available; and
- raising new external equity.

Whether one of these, or a combination, was used would depend on the viability of the options and the scale of the injection needed.

Providing an overall framework for this approach would be a continuation of the licence requirement for the operator to retain and investment grade credit rating. This should also ensure that the decisions about the WACC etc are provided with an appropriate long-term framework such that costs should not unduly escalate.

3.1. Supplementary ratio information

It was noted above that Ofgem could provide indicative information to companies and investors about the degree of new equity required through a consideration of some financial ratios. While considering which ratio or ratios would be most appropriate we have focused on those that the regulators have tended to utilise for their existing tests. Of these the ones that we believe are most important are those linked to forms of interest cover. Gearing can also be considered but more as result rather than a driver of the outcome.

Two measures of interest cover have been used by us when considering modelling of the existing situation and possible scenarios for the future, especially around the transition period. These are:

- FFO/interest; and
- PMICR.

The latter is less affected by the timing of depreciation flows and consequently may be a better long-term measure, although both have been used by regulators.

Our modelling, which we believe to be of a type appropriate for Ofgem when providing indicative information, can utilise either of the measures. What is important is getting the right value for the measure – we consider in the modelling two different values and demonstrate the vital importance this has for the indicative level of equity injection needed. The higher values, based on how regulators currently model financeability could be considered conservative owing to the way that financeability has been viewed. Under the new regime it may be possible for companies to negotiate lower values and consequently have less need for new equity.

3.2. The building blocks

The approach outlined above does place a greater emphasis on getting the input values for the building blocks "right". This includes:

- depreciation policy allowing full recovery of the assets cost over the economic/useful life of an asset and being realistic about the future lives (which could be especially important for elements of the gas distribution network);
- capitalisation should be appropriate such that no additional inter-generational equity issues arise but which is also supportive of a totex based approach to benchmarking and menu regulation;
- the WACC should reflect the underlying non-diversifiable risk characteristics of the business and be based on the best available approaches which would imply a continued use of CAPM supported by additional market information and general inputs from alternative approaches; and
- long-term views about the appropriate capital structure for the industries (but an acceptance that during any individual price control period there may be a significant deviation from that long-term value).

To ensure that the markets view a settlement incorporating these approaches as robust there may be a need to strengthen regulatory commitment. Investors already view the stability created by the approaches to the RAV etc as creating a great deal of regulatory credibility and commitment but if further was needed there are examples available that include:

- greater commitment to future approaches and values; and
- longer-term determinations for elements of a price control.

One possibility linked to the latter point would be to introduce a fixed WACC for capex during a price control period for longer than that control, effectively creating a rolling weighted WACC. Longer-term approaches based on some of the rules around indexation could also be considered. This is discussed later in this report.

It is not clear to us that greater commitment is necessary. However, if it is, there are routes that could be used that would meet investor requirements which are discussed in the following section.

4. REGULATORY COMMITMENT

The issue of regulatory commitment is one that could help overcome concerns about short-termism created by the five year determination cycle and provide the link to the long-term solution.

There are two ways in which regulatory commitment could be strengthened (not mutually exclusive):

- *ex ante* regulatory rules or statements of principle, methodology etc; and/or
- contractual undertakings that stretch beyond the normal five year cycle.

Each is discussed below before the pros and cons of each are considered, as well as their specific applicability to the situation facing Ofgem.

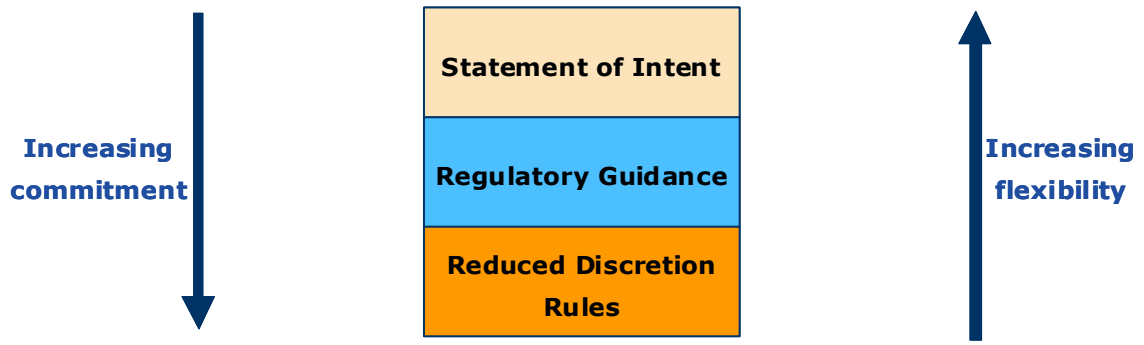
4.1. Role of ex ante rules

Establishing clearer *ex ante* rules is something that is attracting general interest as a way of limiting regulatory discretion and helping address broader concerns about regulatory risk. Interest in clearer *ex ante* rules is seen with:

- the New Zealand Commerce Commission's work on Input Methodologies (and work in Australia on rules for the weighted average cost of capital – WACC);[11]
- Ofgem's consideration of *ex ante* regulation; and
- more general interest in developing reduced discretion rules.

The rationale for developing clearer *ex ante* rules is linked to the issue of regulatory discretion and the extent to which it exists – something that every regulatory regime has to address. There is always a desire to provide as much certainty to investors, companies and consumers as possible while ensuring that the regulator has sufficient flexibility to respond to future events. Certainty and predictability helps limit regulatory risk and consequently can lead to a lower cost of finance. Figure 4.1 illustrates the forms of mechanism or process available to limit regulatory discretion and the relative impact it has on flexibility.

Figure 4.1: The commitment/flexibility trade-off



[11] The Australian rules are discussed in Annex 1.

Recent regulatory decisions have focused on the degree of regulatory discretion with the New Zealand Input Methodologies as an example of a regulator being mandated by its Government to establish a low discretion environment. There are, however, good examples of regulatory guidance that can be considered. In the UK the CAA has provided quite strong guidance on the way that future price reviews will be undertaken – see Box 4.1 below.

More detailed and binding regulatory commitment can also be provided, the development of the Input Methodologies in New Zealand is one example and the production of some of the Australian Energy Regulators documentation is another. In the case of New Zealand there has been a process to update the Commerce Act 1986. The Commerce Amendment Act 2008 introduced significant changes to parts 4, 4A, 5 and 6 of the Commerce Act 1986. The objective of the review was to ensure that the regulatory provisions promote the long-term benefit of New Zealand consumers and to reinforce the Government's objectives surrounding infrastructure investment.

Box 4.1: The CAA regulatory guidance

At the recent CAA determination of Heathrow and Gatwick charges, the CAA provided an annex, titled "Regulatory Policy Statement." This policy statement was an update of a document issued by the CAA in 2003. The second section of the document provides a forward looking statement about Q5 (the fifth five-year price control period from April 1st 2008 to March 31st 2013) and beyond.

The statement covers key issues such as:

- the allowed rate of return;
- the development of future capacity; and
- the mid-term review of investment.

In relation to the cost of capital, the CAA stated that it would expect future assessments, including of the cost of equity, to strike an appropriate balance between reflecting changing circumstances and maintaining regulatory consistency so as to deliver investment required to meet users' needs.

It also proposed that a mid-term review of capital expenditure be undertaken. The proposed scope for this review (subject to consultation early in Q5) is:

- development and application of cost benchmarks to the Q5 capital investment plan and, prospectively, to the initial development of capital plans for Q6 and beyond;
- application and evolution of risk allowances for projects;
- progress in management of certain risks at airport investment portfolio rather than individual project level, and implications for setting future risk allowances;
- BAA's consultation performance against its revised agreement on information disclosure and consultation (Annex G to the decision document); and
- at Heathrow, consultation on, and efficient delivery of, preliminary capital expenditure associated with the expansion of airport capacity via mixed mode operations and/or a third runway.

The CAA anticipates consulting on the scope of the review in summer 2009, and then conducting the review between April and December 2010.

Source: Annex E, Economic Regulation of Heathrow and Gatwick Airports 2008-2013 – CAA decision, March 2008 http://www.caa.co.uk/docs/5/ergdocs/heathrowgatwickdecision_mar08.pdf

The most relevant change resulting from the amendments is the requirement for the Commission to determine upfront input methodologies for services regulated under Part 4 of the Act (as amended). Currently these are electricity lines, gas pipelines, and specified airport

services. Examples of methodologies that are required to be established by the Commission include cost of capital, valuation of assets, allocation of common costs, treatment of taxation and pricing methodologies. Input methodologies are required to be established by 30th June 2010.

Under the updated Act, the purpose of the input methodologies is described as being to promote certainty for suppliers and consumers in relation to the rules, requirements, and processes applying to a particular regulation. Box 4.2 at the end of this section sets out the Commerce Commission's draft guidelines to estimating the cost of capital. However, it should be noted that these guidelines were prepared prior to the recent amendments to the Commerce Act 1986 and revised versions were published during the summer of 2009 along with the significant Input Methodologies Discussion Paper. These Guidelines (once finalised) will apply to all sectors regulated by the Commission, including telecommunications and dairy (regulated under separate pieces of legislation). Therefore these Guidelines will not be an "input methodology" but the input methodologies relating to the cost of capital for the services regulated under Part 4 will be consistent with these Guidelines.

4.2. Contractual undertakings

An alternative, but potentially complementary, way of establishing credibility is to commit through some form of contractual (or statutory instrument) undertaking as a way of establishing commitment. There are various ways in which an actual or effective contractual undertaking could be established:

- a long-term instrument, as per the OFTO regime (a 20 year commitment) which embodies the regulatory regime; and
- a long-term instrument which provides for certainty about aspects of the regime while allowing sufficient flexibility for elements that need to change (OPPPA's approach to aspects of the London Underground PPP mirror this approach).

There is an alternative approach, used in Spain and Latin America, where the undertaking is incorporated into law. Now, the extreme version of establishing a specific rate may be too inflexible, but incorporating a set of detailed rules into law – along the line of the rolling average WACC discussed later – could create greater certainty and commitment. Of course, a law can be changed but this requires time and is also quite transparent. Further, investors may have recourse to some form of court – although the change in law associated with the speeding up of retail competition in the gas industry post the 1990s MMC inquiry while being controversial for investors was ultimately something that did not lead to compensation. However, an alternative was the consideration by Ofreg of how more competitive prices could be achieved in Northern Ireland while the initial power purchase agreements were in place and this was stymied by the contracts.

4.3. Pros and Cons

Table 4.1 summarises the pros and cons of the different approaches.

Table 4.1: Strengths and weakness of the two approaches

Aspect	Ex ante rules	Contractual undertaking
Degree of commitment	Limited unless the rules are enshrined in some form of undertaking	Strong, especially if in a contract since compensation could be sought
Ability to commit	If incorporated into a determination or a published document then Judicial Review should be possible if the rules are not applied. Whether this is sufficiently strong is a concern Even if followed through a company could still choose to appeal and it is not clear if the Competition Commission would accept the *ex ante* rules	It would appear from the legislation and licence structure that Ofgem could propose a longer control period without requiring any legislative change. So, in principle Ofgem could commit through a licence amendment and this would only be subject to Judicial Review (any stakeholder) or appeal to the Competition Commission (CC) (the licensed companies). Of course, a future regulator could choose to review if the control is in the public interest or a company could seek to have the clause disapplied. The latter faces specific time lines while the former could be appealed to the CC.
Predictability	Provided that the approach is employed, there is greater predictability of what the value set at a determination will be.	Depends on the approach adopted. It is possible for there to be significant regulatory discretion when the estimate is set but then predictability during the period – which could be a long time.

Overall it would appear that under current legislation there is a degree of flexibility for Ofgem to be able to commit to a longer-term deal within the licence framework. This creates more certainty but it still has some weakness. That could, however, be dealt with in part through the use of *ex ante* rules setting out how questions would be addressed and future values calculated.

Box 4.2: Draft Guidelines for estimating the cost of capital

- To derive the cost of capital for a firm, the Commission calculates its weighted average cost of equity and debt (the weighted average cost of capital – WACC).
- The Commission estimates the cost of equity using a simplified version of the Brennan-Lally Capital Asset Pricing Model (CAPM).
- The risk-free rate is used in the calculation of the cost of debt and the cost of equity. The Government bond rate is used as a proxy for the risk-free rate. The term of the risk-free rate is intended to match the regulatory period to ensure the NPV = 0 principle holds. Further, the Commission considers that rates should be averaged over a period in order to smooth any abnormal effects.
- The Commission relies on the direct estimation of the asset beta of the firm in question and the analysis of comparators' asset betas. To select comparators, the Commission seeks to make use of firms that face a similar level of systematic risk, and considers a number of factors, such as the industry characteristics.
- The cost of debt is estimated for the same period as that used to determine the risk-free rate. The cost of debt is determined as a premium over the risk-free rate.
- Applying the parameter values estimated by the Commission, it may be possible to derive a WACC with an associated statistical distribution.
- The Commission notes that the consequences of finding excess returns when they do not exist, or setting prices too low, are more severe than the contrary error. The Commission therefore generally chooses a WACC equal to or above the mid-point to reflect this asymmetry in risk. The particular margin adopted for an industry is a matter of judgement for the Commission.
- In the past, the Commission had not adjusted its estimate of WACC to account for the potential costs arising from asymmetric risks, financial distress, extinguished timing options, or firm resource constraints. However the burden of proof lies with the companies.

Source: Commerce Commission (2005)

5. DEPRECIATION

5.1. The use of depreciation in energy regulation

A key building block for a regulatory revenue determination is that of depreciation. Depreciation can be thought of in several ways, two of which are:

- a form of revenue profiling reflecting the way in which future revenue streams (normally associated with tangible assets but potentially reflecting a broader recovery of costs) are to be profiled; or
- a measure of the consumption of capital that takes place when a service is provided today at the expense of the service being provided to a future consumer.

UK, US and some continental European country regulation has focused primarily on the former issue rather than the latter, although from an economic perspective it is the latter that is important.

This section firstly investigates the revenue profiling issue and some of the options that are available and then considers from an economic perspective what might be a more consistent basis on which depreciation should be based.

5.2. Depreciation as a revenue profiler

By identifying depreciation with revenues as is done by current UK regulatory treatment it forces a particular pattern of revenue recovery. This is more front end loaded than may be expected by a company in other markets – especially more competitive ones.

What kind of alternative revenue profiles could be constructed that might mimic those in other sectors, constructed so that the net present value of future revenues is the cost of the investment. Figure 5.1 below shows the revenue profile for four different profiles:

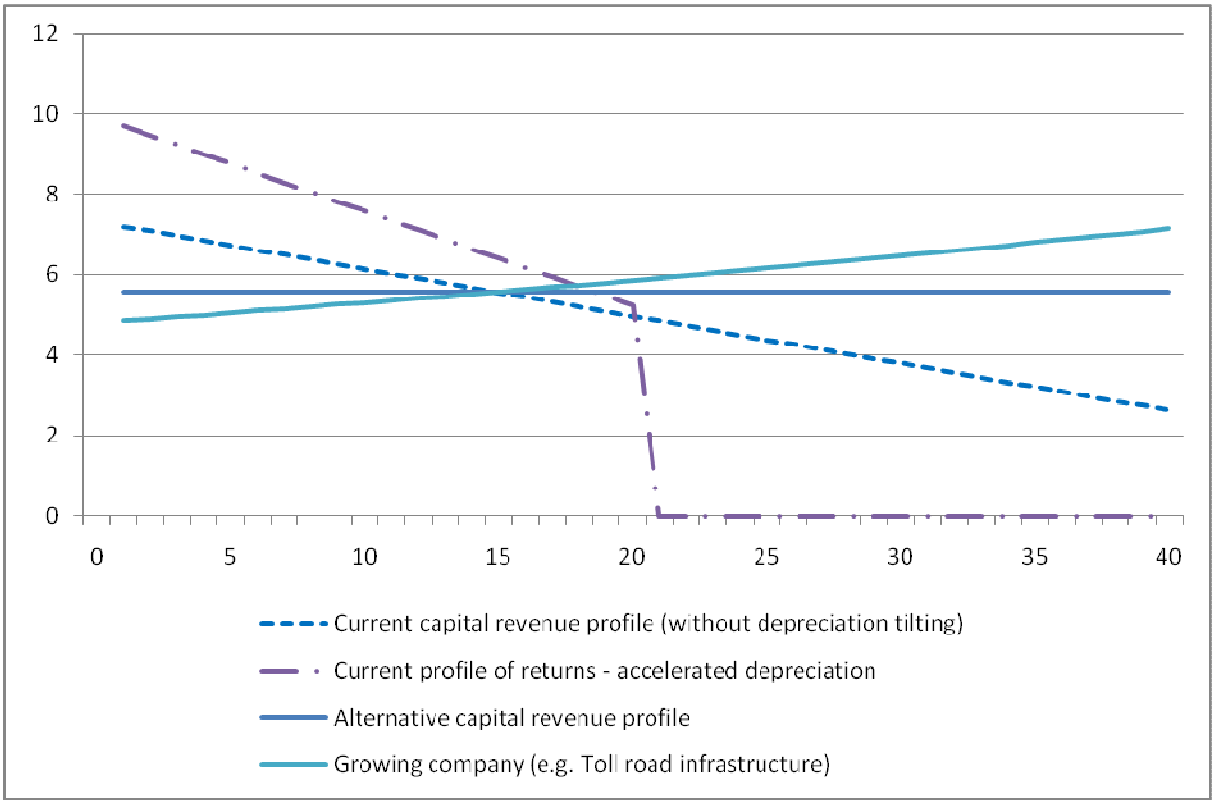
- constant revenue over the life of the asset;
- revenue increasing at 1 percent per annum;
- constant rate of return on assets depreciated using a straight line over the life of the asset; and
- constant return on assets with accelerated depreciation.

It can be seen from this that the revenue in the early years of the asset life using the current approach to depreciation is roughly double that which would be recovered under alternative methods.

This matters. Customer charges as a result of the investment are higher than they would otherwise be. This may mean that regulators may wish to scale back investment that is economically efficient in order to limit increases in customer bills or to allow for perceived "financeability" constraints.

The structure of charges for long-lived infrastructure need not have the current profile used by Ofgem. For example, motorway concessions are typically structured so that returns are very limited in the early years, with revenues and returns building over the life of the concession.

Figure 5.1: Comparison of different revenue profiles predicated on different depreciation profiles



Source: CEPA analysis

The profiles were constructed so that the net present value of each revenue profile over the asset life of 40 years, using a real cost of capital of 4.7 percent, is identical. With the "current capital revenue profile" the return on assets is the same each year (at 4.7 percent). With the accelerated depreciation profile the capital is reimbursed over 20 rather than 40 years.

This thinking suggests that we should consider what the profile of returns on assets should be, rather than the narrower question on what the right measure of depreciation is, although ensuring that the right depreciation charge is incorporated into the building blocks is important (and is discussed further below). But what is equally important is ensuring that an appropriate revenue profile is established and this will be determined in part by considerations of the intensity of use of the asset by customers at different times, as well as intergenerational equity. Once that issue is resolved, issues of financing a profile can be considered.

5.3. Economic depreciation

From an economic perspective, depreciation is a measure of the consumption of capital that takes place as a service is provided to consumers. It reflects the fact that providing a service to consumers today means that future consumers will have less access to services and so, is at its heart, a measure that is concerned with intergenerational equity since it is assessing the impact that one "generation" of consumers have on the ability of future generations to consume. This is

a very different approach to what is normally considered depreciation by accountants, although much of the difference arises from the practical considerations involved in the measurement of depreciation rather than intrinsic underlying theoretical concerns. What neither measure is concerned with is the repayment of the funding associated with the provision of the service. That is a separate (but linked) consideration.

At its purest, an economic measure of depreciation would be provided by:

$$depn = MEAV_t - MEAV_{t-1}$$

That is, the measure of depreciation is the difference in the Modern Equivalent Asset (replacement) value of the assets between two dates.[12] Of course, the measure needs to be corrected for any investment that has taken place.

However, this approach is not employed by UK regulators, rather approaches building on accounting principles tend to be used.

5.4. Asset life

The relationships set out above provide a general framework for considering what asset life should be applied. There are some special cases where, while the basic relationship holds, some care is needed in the application. For example, what happens about the useful asset life for infrastructure that has a single user whose own useful asset life is different to that of the infrastructure?

Take the example of a gas field and the transmission infrastructure linking this to a national network. Suppose the gas field has an expected life of below 10 years while the transmission infrastructure has a useful asset life of over 30 years. What is the appropriate useful asset life for the transmission line – 10 or 30 years? The answer will, in part, depend on whether there are alternative uses for the infrastructure. In the case of a gas field there is the possibility that a further gas find will occur which might extend the life of the infrastructure (depending on the timing of the find, the available capacity of the line etc). As such, the choice of useful asset life could be important since it will affect the speed of recovery as well as the incentives for finding further uses for the infrastructure. While the discussion about gas fields may have limited impact on choices in the UK, the recent push for off-shore transmission could face similar issues but on a much larger scale.

5.5. Review of useful asset lives

If a system based around remaining useful asset lives is adopted, as we believe it should be, then the question of how frequently asset lives should be reviewed has to be addressed. There is clearly a trade-off between creating a significant workload for the regulated companies and having relevant and up-to-date information. Companies ought to review depreciation policy:

- when significant changes occur in the industry; and
- periodically to ensure that adopted policies are appropriate.

[12] See for example the CRI article on long run marginal costs by Ralph Turvey which discusses this issue.

As such, Ofgem should require the sectors to establish new useful asset life estimates in the short-term (the period would depend in part on the speed of any transition period, discussed below) and then either every 10 years or when a significant event occurs. It would be up to Ofgem and the sector companies to work together to determine whether a significant change has taken place but if, for example, heat-pumps were to significantly develop in the UK then the implications for gas distribution might be of sufficient importance to require a review of the useful asset life and likely utilisation.

5.6. Form of depreciation

When considering the form of depreciation to apply there are multiple approaches possible, including:

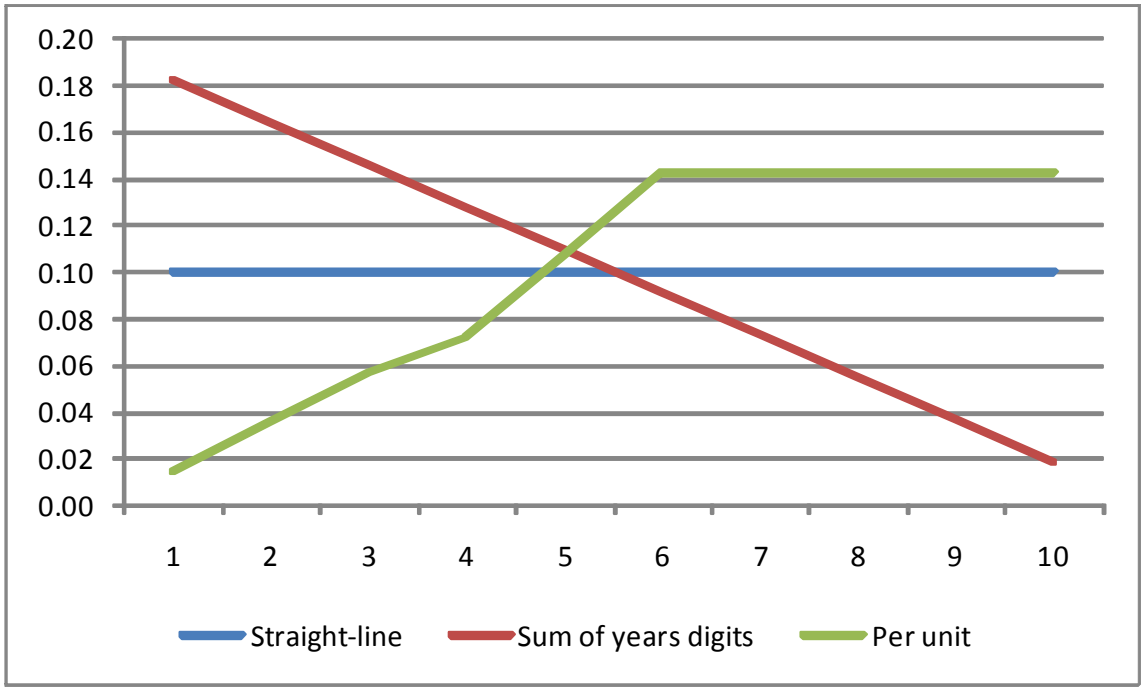
- straight-line;
- sum of year digits; and
- per unit.

While there are many other forms, these three approaches are able to illustrate the impact of choosing between the different forms. Each is briefly discussed below, before an example is used to illustrate the impact of the choice.

- Straight-line depreciation is the standard approach employed for depreciation and is based on making an equal allowance for depreciation for each year of the useful asset life – so if an asset has a 20 year life then 1/20th of the asset value is taken as a depreciation charge each year;
- Sum-of-years digits is an approach that accelerates depreciation, i.e. front end loads the recovery of the value. The allowance is set by using the formula: (remaining life/sum-of-years digits); and
- Per unit depreciation is based on estimating the total quantity of service likely to be provided by the asset and then allocating a charge each year based on the level of service being provided in that year – so if utilization is going to change over the life of an asset then the depreciation charge will change accordingly.

What impact does each of the approaches have? Consider the illustrative example provided below in Figure 5.2 – in this case an asset with a 10 year life is being depreciation, with utilization starting low and reaching a maximum after year six. As can be seen, the sum-of-years digits approach front-end loads the charges relative to straight-line depreciation and, in this case, the per unit charge back-end loads charges relative to straight-line depreciation.

Figure 5.2: Impact of the choice of depreciation form



There are also circumstances where a completely different approach to depreciation is adopted – that of infrastructure renewals charging. This approach, used extensively in the water industry where useful asset lives (especially technical) are far from certain is based around levying a charge sufficient to keep the level of service offered by the assets unimpaired. Effectively consumers ensure that they pay for the impact that they have on the service offered by the assets. The way in which this is calculated at least in the UK water industry, however, is more focused on the expected cost of repairs and maintenance rather than a direct assessment of the impairment of the assets and the service provided.

5.7. Regulatory precedent for approaches to depreciation

The treatment of depreciation in regulated industries is something that has attracted significant attention owing to the cash-flow implications more so than the underlying principles. Most UK regulated companies have a standard approach applied to them – straight-line depreciation over an agreed useful asset life. In some cases, most notably energy and airports, accelerated depreciation is used to advance cash-flow for financeability problems.

There are, however, examples of other approaches being adopted in the UK and more generally. In terms of useful asset life the main examples are:[13]

- Electricity distribution and transmission in Great Britain where the useful asset life has been set at 20 years rather than 40 years.

[13] One of the best examples of varying asset lives is provided by airport runways. Post privatisation BAA changed the asset life several times in a relatively short period with the net effect of increasing the average life of a runway from 25 to 100 years. Whether this would have a regulatory impact depended on how the CAA responded to the changing asset life. This example is discussed in detail in Terry Smith's Accounting for Growth, 1992.

- Gas distribution in Great Britain where the effective useful asset life for half the iron mains replacement investment is set at zero years, i.e. the capex is directly expensed to customers rather than incorporated into the RAV and depreciated.
- Gas distribution and transmission in Great Britain where pre-2002 assets are treated differently to post-2002 assets. Pre-2002 assets are depreciated on a straight-line basis (as are the post-2002 ones) but the investment pre-2002 has been assumed to have been on a flat basis so smoothing any investment humps and effectively front-end loading some of the depreciation since the actual investment had not been on this smooth profile.
- Gas transmission in the Republic of Ireland where the useful asset life for the gas interconnector to Great Britain has been set at 100 years even though the technical life is expected to be 50 years.
- Rail access in New South Wales (Australia) where the useful asset life is set based on the useful life of the mines that are being serviced rather than the actual technical life of the track. The way in which investment into new mines then impacts on this is something that the New South Wales regulator considered as part of a review. Similar situations can arise with gas transmission lines serving single gas fields where the possibility of further new fields exists but sites are currently unproven.

The rationale for some of these decisions is provided in the table below.

Table 5.1 Rationale for the useful asset lives used

Example	**Rationale**
Electricity distribution	A shortened useful asset life was implemented to address a financeability problem.
Iron mains replacement	Two arguments were initially put forward: (i) this reflected the health and safety impact of the investment; and (ii) the proposed profile ensured that prices did not fall and then rise again but rather had a smoother profile.
Irish gas interconnector	A longer useful asset life is being applied as a way of keeping the marginal entry point for gas in an entry-exit regime at a low price, especially important when utilization of the interconnector is expected to fall as other sources of gas become available.

Examples of approaches other than straight-line depreciation (for reasons other than financeability) also exist but are less frequent. They include:

- electricity distribution in Great Britain where traditionally two straight-line rates were used, 2 percent for 20 years and 3 percent for the other 20 years effectively creating a kinked depreciation profile;
- the Irish aviation regulator, CAR, introduced two different depreciation forms for post-2009 assets – annuities and unitization are applied to different categories of new assets at Dublin Airport while pre-2009 assets are still depreciated on a straight-line basis; and
- Australian telecoms, through the use of forward looking models, employ an annuity based approach to depreciation.

5.8. Proposed way forward

The rules by which a depreciation charge is set should be based on the following:

- Useful asset life – should reflect the remaining economic life of the assets (provided that his is no longer than the technical life) and should be reviewed periodically (every five or 10 years) or when significant events occur.
- Form of depreciation – should depend on the circumstances of the industry. Specifically, for industries with:
    - fairly flat demand (low or no growth) straight-line depreciation is appropriate;
    - falling demand (negative growth) a front-end loaded depreciation charge is appropriate; and
    - rising demand (positive growth) a back-end loaded depreciation charge is appropriate.

With respect to the back- and front-end loaded charges, the choice of actual approach is less clear. Some form of charge based on likely future demand would make sense, with five yearly reviews of this allowing an appropriate opportunity for fine tuning the charge.

Given these rules, our initial thoughts concerning the appropriate approaches for the sectors regulated by Ofgem are set out below:

- Electricity transmission – stable? So straight-line over economic life.
- Gas transmission – stable?[14] So straight-line over economic life.
- Electricity distribution – real possibility of growth as low carbon changes the nature of energy demand. So, an approach that recovers a back-end loaded charge over economic life?
- Gas distribution – real possibility of reducing demand by households as low carbon impact shifts gas to generation and household demand to electricity and alternatives. So, an approach that is front-end loaded over economic life, or at least straight-line over an economic life that reflects the increased uncertainty about future use.

These are initial thoughts and clearly require further analysis and consideration. For example, the situations with respect to gas and electricity distribution need further consideration but there is ample evidence in Project Discovery (the first report on scenarios) and from National Grid about falling gas distribution demand (down from over 700 TWh in 2004/5 to close to 600 TWh in 2008/9[15]) and electricity growth (heat pumps and electric vehicles could add between 15 percent and 20 percent to annual electricity demand by 2025).

[14] Although the level of gas distribution demand may fall, a compensating increase in gas-fired generation could offset this.

[15] While this reduction is partly influenced by the recession, it is part of a longer trend driven by improving energy efficiency and rising end-user prices. These figures are drawn from National Grid's 2009 Gas Transportation 10 Year Statement.

If there is still a revenue profile issue then that should be addressed separately as per the general financeability question discussed earlier.

http://www.nationalgrid.com/NR/rdonlyres/E60C7955-5495-4A8A-8E80-8BB4002F602F/38866/TenYearStatement2009.pdf

6. CAPITALISATION

Linked to the question of depreciation is the issue of what asset value is being depreciated – Section 5 discussed the useful asset life and the form of depreciation but it did not discuss the asset value. For energy networks this issue is under discussion with respect not to the way in which investments are being valued as such, but rather what quantum of value is being incorporated into the RAV.

6.1. The DPCR5 approach – fast and slow money and the implications

The last electricity distribution determination implemented a different approach to capitalisation. Rather than adding the *ex ante* value of the capex to the RAV as has been the approach since the first price reviews after privatisation, a fixed proportion of Total Expenditure (Totex) is included in the RAV. At DPCR5 this proportion was set at 85 percent - so 85 percent of Totex is incorporated into the RAV and depreciated (what Ofgem now refers to as "slow" money) while 15 percent is expensed directly to consumers in the year that it is incurred (now referred to as "fast" money).[16]

In part this can be seen as a response to the gaming of opex and capex that previously took place owing to the differential treatment of the two types of expenditure. However, at DPCR5 there was also a levelling of the incentives between opex and capex when opex was included into the Information Quality Incentive (IQI – also known as "menu regulation").

What is the impact of incorporating a fixed percentage of Totex into the RAV? It breaks the link that existed between the RAV and "investment" and means that the "fixed asset" part of the RAV is no longer there. Effectively a regulatory value (RV) or an IOU is being created with this approach to capitalisation. Of course, the link between the investments made and the RAV was already tenuous. The RAV is based on a mixture of *ex post* and *ex ante* values while investment is purely *ex post*. This break, however, was just a five year mismatch as the capex incentive was realised. The introduction of menu regulation has meant that it is no longer clear that this mismatch still exists since the incentive can be paid separately to the RAV.

Does breaking this link matter? Provided there is sufficient regulatory credibility that funds will be returned over the long-term then it should not have a significant impact. Although if the percentage capitalised over the long term deviates from the true investment that is occurring, then this could create additional pressures on investors.

To illustrate, suppose the true level of investment was only 70 percent but 85 percent of costs are being capitalised, i.e. the amount being capitalised exceed actual capex. Two implications arise:

- investors may need to provide additional equity to ensure the company is financeable since a short-term mismatch arises with the cash-flows which equity injections would be required to address; and

[16] We note that there were some exceptions to the 85 / 15 split, including business support and non-operational capex.

- existing consumers pay less for the service they are receiving than they should do (even with accelerated depreciation) and consequently future consumers will pay more than they ought to.

The first of these implications may not matter. Provided the right level of return is being allowed, investors may be indifferent to the speed of recovery of totex. However, if raising equity is not costless, which clearly it is not, and this approach is being implemented at a time of high capex relative to historical levels, this may increase the pressure on investors to provide equity and increase the cost of this relative to what would otherwise have occurred. This cost will be borne by consumers.

Further, the second implication, that of making current consumers pay either more or less than they would otherwise, seems to re-introduce the issue of inter-generational equity which plagued the accelerated depreciation policy and which Ofgem is now seeking to undo. Of course, this problem will not arise if the capitalisation rate is correct (that is, equal to the amount of capex), but it is far from clear that a single rate applied to a whole industry would be able to achieve this.

6.2. Making the DPCR5 approach work in the long-term

In the light of the above, the rationale for introducing this capitalisation policy is something that may need to be reconsidered. When there was differential treatment of opex and capex this new fixed percentage of totex approach would have been a solution to the issue of incentive equalisation (although whether the disadvantages of the approach were too significant would still need to have been carefully considered). However, the inclusion of opex into the menu regime should have overcome the differential treatment of opex and capex issue and consequently it is not clear to us that this additional action is needed.

There may be broader reasons why a totex capitalisation regime could be appropriate. Other building blocks, notably the menu incentive and possibly benchmarking (Ofgem is investigating as part of the RPI-X@20 review a shift to totex benchmarking in place of separate opex and capex benchmarks). This focus on totex could be supported by the capitalisation policy and subsequently any change should be placed into this broader context.

If it is deemed to be required, can the concerns raised be mitigated? There would seem to be two approaches that could be followed, similar in some respects to the notional gearing issue discussed later in this report. They are:

- a long-term industry average capitalisation rate is chosen and implemented; or
- short-term capitalisation rates are selected at each determination and there may be differences between capitalisation rates for companies (or bands of companies) depending on where they are in the regulatory investment cycle and dependent on their cost bases.

If the long-term approach were adopted then it is clear that there will be periods when actual true capitalisation is either above or below the allowed long-term rate. This will imply that investors will have to make additional capital structure adjustments and also that inter-generational equity issues will arise (over the long-term provided the right capitalisation rate has

been chosen this will average out, but in long periods of marked investment this could lead to significant and potentially long-term inter-generational equity issues).

Adopting a short-term approach would more closely mimic what happens in competitive markets but would also require regulatory actions at each determination and the possibility of greater uncertainty if the rules by which inclusion in certain bands and the determination of the allowed capitalisation rates is not clear. This is an additional level of complexity but could be justified by the broader context.

6.3. Proposed approach

Overall, a rationale for introducing a capitalisation approach could exist if there is differential treatment of opex and capex, the solution of aligning the incentive rates for the two forms of totex is arguably simpler and has already been done in the one example where the common capitalisation process has been employed, DPCR5. Given the broader focus on totex, if it were possible to assess rates of capitalisation that were both company specific and price control specific and were reflective of individual company's actual levels of capex it is likely that the concerns raised in this section would be largely mitigated. This would seem to be an appropriate way forward.

7. THE ALLOWED RATE OF RETURN

A key building block is that of the WACC. Given its importance we consider general aspects of the overall approach in this section and then some more detailed implementation issues in the following section.

In this section we consider whether a single WACC is appropriate and the overall approach to the financial structure of the industries as shown in the role of gearing and signals for equity injections.

7.1. A differential cost of capital?

A question that has surfaced several times over the past 10 years (for example: in water PR99, PR09 and for rail the 2008 determination) is whether a simple forward looking weighted average cost of capital (WACC) should be applied or whether something more complex is needed. This question arises because the WACC is effectively doing two things:

- rewarding existing capital; and
- providing an incentive for new capital required to meet capex requirements for the next five years.

It is likely that in normal market conditions that the rate required on both a forward and backwards looking basis would, on average over the economic cycle, be the same. However, two things may change this:

- The use of headroom in the WACC. If headroom is justified it is likely to be justified on the basis of uncertainty about future rates – this would seem difficult to justify once the actual risk free rate (or cost of borrowing) is known.
- Structural shifts or periods of increased volatility. If the market moves from one average to another for some reason, or increased volatility arises, there is a risk that the forward and backward looking rates diverge rather than trend to the same average.

Even if the latter situation is unlikely, or debatable, the former is most definitely the case. As such, concern has focused on whether the same value can be used for both backward looking and forward looking rates.

7.1.1. Regulatory precedent

While no regulator has formally adopted a split or differential WACC to date, there are precedents that provide effectively that outcome. Two can be considered:

- embedded debt; and
- WACC "incentive" add-ons.

Embedded debt implicitly creates two separate WACCs, one backwards looking and one forwards looking, through an adjustment to the allowed cost of debt for existing debt. This has been used explicitly by some UK regulators and implicitly by another. Examples include:

- Ofwat's embedded debt premium for PR99 and embedded debt discount for PR09;
- ORR's embedded debt discount in its 2008 determination; and
- Ofgem's choice of a WACC which mirrored values justified through the use of an embedded debt discount.

In each case the ability to unpick how the embedded debt adjustment has been made is far from clear. The basis on which a different value for the embedded debt and whether this incorporates an adjustment of the headroom is not provided.

The second way in which WACC has been differentiated is through explicit uplift for all, or some, new assets. This was proposed in America through FERC Order 2000 for transmission assets and is used in France for certain gas transmission assets. The rationale for the degree of adjustment made to the forward looking WACC does not seem to be justified, that is the uplift has exceeded the additional risk borne.[17]

7.1.2. A "split" cost of capital

There has been significant debate to date about a version of the differential WACC, referred to as the split cost of capital. We believe this argument, as set out by proponents like Professor Dieter Helm is fundamentally different to the idea that we are considering for a differential WACC.

If one considers the arguments put forward for a split cost of capital they are concerned with perceptions of risk and, at the extreme, lead to the proposal that:[18]

- backward looking assets would receive a cost of debt; and
- forward looking assets would receive the cost of equity.

This is basically an argument about how markets finance assets with different classes of risk not about whether assets that were funded at different times in an economic cycle should receive the same or different returns reflecting the overall financial market at the time that funding occurred. It is far from clear to that one would ever fund regulated assets with purely one form of finance, even if capex were as risky as Professor Helm proposes. See for example our discussion of anticipatory investment later in this report.

There is an issue as to whether the financial structure forward looking would be different to that backward looking if there was a significant difference in risk, but we do not believe that we are in a position where a significant difference in risk exists. If anything, the proposals in this report would work to minimise any differential in risk since clearer rules and greater commitment would exist.

Some regulators have tried to encourage additional investment through offering a higher rate of return on new investments. The examples of general incentives like this, for example in the US and France, seem to be based on providing higher returns with no justification for a difference in

[17] Unless there is just a simple "addition" being given to encourage investment but even that should be justified on some basis, such as the value placed on the investment by consumers.

[18] See for example, *Split cost of capital, indexed cost of debt and longer periods – a reply to critics*, March 2006, Dieter Helm, available to download from www.dieterhelm.co.uk.

risk leading to that size of difference. Rather it is a general sweetener. It is far from clear whether this type of approach will actually have an impact on the marginal incentive to invest, especially if output regulation is being employed. Companies will need to meet their output requirements and consequently will undertake whatever investments are necessary provided the penalties for failing on outputs are sufficiently high. Any disagreement as to whether sufficient incentive for investment exists would likely be played out in appeal at the time of the determination rather than through delayed investment etc.

There is a UK example of a differential rate of return being allowed, that was for T5 at Heathrow. A higher rate of return was justified on the basis of the scale of the investment and the riskiness of the new investment relative to existing assets – quite how great that difference in risk was is not clear owing to the way that BAA only took risk during the price control period – however, a higher return was allowed. That lasted only for the life of that price control.

Consequently the remainder of the discussion about a differential WACC is focused on providing greater certainty around the impact of the funding cycle and does not consider issues of whether forward looking risk is different. That issue is addressed in part on our section on anticipatory investment.

7.1.3. Options

If different WACCs are to be established, how could this be done? Three possible approaches seem to be available, although others are also bound to exist. These are:

1. the establishment of completely separate WACCs for forward and backward looking elements with rules as to: (i) how the backward looking WACC is set (i.e. linked to headroom); (ii) how forward looking becomes backward looking at the next review; and (iii) how much of the capital structure is presumed to be re-financed each control period;
2. a continuation of the existing averaged approach but with clear rules as to: (i) when embedded debt should be considered; (ii) how the backward looking WACC is set (i.e. linked to headroom); (iii) how forward looking becomes backward looking at the next review; and (iv) how much of the capital structure is presumed to be re-financed each control period; and
3. an alternative approach whereby a rolling average WACC is established.

With respect to the latter, what could be envisaged is:

- The allowed WACC is a weighted average of a new forward looking WACC and the WACCs from previous determinations; and
- The weights are based on the proportion of the depreciated RAV to which that allowed WACC applies.

In practice it might be possible to limit the averaging to say the forward looking rate plus the last two determinations although in principle something that incorporates WACCs all the way back to privatisation (if pre-privatisation assets are still un-depreciated). If the pure approach is adopted it is effectively the same as allowing a fixed WACC for the life of an asset.

The first two options are quite standard and only differ inasmuch as whether a single headline rate is desired or it is accepted that two rates should be stated.

7.1.4. Pros and Cons

An initial evaluation of the three options is provided in the table below.

Table 7.1: Assessment of the options

Criteria	Blended rate	Separate rates	Rolling rate
Transparency	How the rate is established could be transparent but not clear that the message about future rates is as clear as it should be (especially if the basis for the backward looking rate is not made transparent).	Transparent both in terms of how the backward looking rate is set (potentially) and the appropriate forward looking rate being used for new investment.	Should be transparent in terms of the way it is calculated but still an issue as to whether the forward looking rate is sufficiently clear.
Predictability	If the rules about the adjustment to the backward looking rate are clear, then it is more predictable than the existing approach.	If the rules about the adjustment to the backward looking rate are clear, then it is more predictable than the existing approach.	Predictable since no adjustment is being made to the backward looking rate.
Commitment	The certainty created with respect to existing debt and how it will be treated should create greater commitment than currently exists.	The certainty created with respect to existing debt and how it will be treated should create greater commitment than currently exists.	Greater certainty than currently exists is being created since the rate allowed at a review becomes enshrined into the rolling rate.

What is clear is that, provided the rules by which a backward looking rate are adjusted are clear, any of these options would be an improvement on the existing slightly ad hoc approach that is adopted.

7.1.5. Proposed implementation options

We believe there are several ways in which the differential WACC approach could be implemented. Table 7.2 summarises three of these. Each has strengths and weaknesses. If the overall proposal for a differential WACC is adopted then one of these, or something similar, would need to be developed in detail.

Table 7.2: Assessment of implementation options

Criteria	Blended rate	Separate rates	Rolling rate
Period and weights	Last two determinations are used with weights based on the net proportions of the RAV – with everything before the first included determination rolled-up into that weight.	Last two determinations are used with weights based on the net proportions of the RAV – with everything before the first included determination rolled-up into that weight.	Determinations reaching back to when investments were made with the weight based on the net proportions of the RAV
Backward looking adjustment	Headroom adjustment defined as the difference between the allowed risk-free rate and a single pre-set measure of the risk-free rate at the time.	Simplistic 50 basis point reduction applied to the risk-free rate.	No adjustment.
Refinancing	Allowed through the weights	Allowed through the weights	Not allowed

7.2. Role of gearing

While notional gearing is a well established feature of network regulation, there remains a lack of clarity around certain elements of its nature. Notional gearing has multiple roles in the current price control settlement. However, the philosophy behind its use has a number of additional implications for financeability that are not clearly addressed by regulators.

7.2.1. Ofgem's use of notional gearing

Ofgem currently define notional gearing as net debt expressed as a percentage of RAV. It is applied uniformly across all companies within each industry. Based on this definition, notional gearing has three explicit roles in the regulatory settlement of network companies:

- an input to the WACC calculation of the allowed cost of capital – through defining the debt / equity mix and equity beta;[19]
- the assumed capital structure for financeability testing during each price control (feeding back into the WACC); and
- a benchmark above which tax shield benefits of gearing are sanitised.[20]

This use of notional gearing leaves a number of open questions:

[19] It also impacts the debt premium calculated based on the implied credit rating.

[20] Ofgem "claw back" the benefit licences receive from "high" gearing though reduced tax costs. This mechanism is applied in any year when there is a conjunction between actual gearing exceeding notional gearing and interest costs exceeding those modelled in the price control. Given the current definition of notional gearing and the ability to undercut the allowed cost of debt, it is not clear that this incentive is likely to bite for many companies.

- What are the implications of failing at or below notional gearing, where Ofgem has a certain degree of "ownership" of capital structure?
- Is it credible that Ofgem would not step in to rescue a company above notional gearing? What if Ofgem were perceived to be to blame in another respect and gearing was only a partial ingredient of failure?
- Over what timescale should companies be expected to achieve notional gearing? Should this be interpreted in the context of capex requirements?
- Is it a problem that the regulatory definition of gearing does not necessarily reflect companies' actual financial structures?

Some of these areas of uncertainty are addressed through the options considered in this section.

7.2.2. How is it currently set?

Calculation of the notional gearing is relatively opaque and based on a range of factors. However its calculation tends to require consistency with an investment grade credit rating, recent regulatory precedent and must roughly match industrial reality. This relatively ad hoc approach is pragmatic, but sends mixed signals regarding its significance. Ofgem's notional gearing determinations have risen over time with DNO notional gearing increasing 7.5 percent points to 65 percent for DPCR5. Table 7.3 summarises regulatory precedent in this area.

Table 7.3: Recent regulatory precedent on gearing

Regulator	Decision	Gearing assumption
Ofgem	Electricity Distribution (2009)	65%
Ofwat	Water & Sewerage (2009)	57.5%
CAA	Heathrow (2008)	60%
Ofgem	Gas Distribution (2007)	62.5%
NMa	Electricity (2006)	60%
Ofgem	Electricity & Gas Transmission (2006)	60%
Ofgem	Electricity Distribution (2004)	57.5%
CAR	DAA (2009)	50%
CER	Gas Transmission & Distribution (2007)	55%
CER	Electricity Transmission & Distribution (2005)	50%

7.2.3. Notional gearing options

We consider that Ofgem might benefit from taking a clearer approach regarding notional gearing, its interpretation and implications. Doing so could establish it as an effective regulatory tool or at least help to improve credibility. We propose three options for consideration as alternative models for notional gearing:

- long-term notional gearing (LTNG);

- short-term notional gearing (STNG); and
- no notional gearing (NNG).

The premise for considering each straw man is to explore the implications of varying how responsible Ofgem should be for companies' capital structures and how this would adapt to changing needs over time. The premise underpinning this debate is that both companies and markets believe that Ofgem have some degree of implicit ownership over the notionally geared financial structures.

Option 1: LTNG

NG is set at a level reflecting the long-term efficient level of gearing. This would be relatively fixed over time and only be updated following new information regarding the long-term efficient capital structure of a financeable utility. Companies would not be expected to achieve this level of gearing out of steady state. However Ofgem would expect companies to revert towards this level over time. Given the long-term nature of this definition, it would be expected to hold for all companies.

This level of gearing would be used in the WACC calculation and be the basis of financeability tests with an emphasis on long-term performance. It could also be an anchor for tax neutralisation.

Given the presumption that companies would deviate from LTNG over time, this approach would not automatically limit Ofgem's responsibility for reckless capital structures. Therefore a LTNG could be usefully supplemented by introducing bands within which it would consider gearing to be acceptable. For example, Ofgem could set LTNG at 60 percent, based on the assumption that companies would fluctuate between 45 and 75 percent. Companies could possibly have to justify their position towards the edges of these ranges and be required to rethink their capital structures if they strayed outside the boundaries. While Ofgem might expect companies to revert towards LTNG over time, there would be no obligation for them to do so.

Option 2: STNG

Notional gearing is set based on a level that is appropriate for each company over the next five years. Ofgem would set and endorse a level of gearing for each company based on a range of factors, but primarily influenced by capex financing requirements relative to RCV. Notional gearing could be set in a number of ways:

- industry-wide – moving alongside an overall "investment hump;"
- by group – setting notional gearing for a number of "classes" of firms with similar characteristics; or
- firm-specific – based on a formula, allowing all firms to have an independent notional gearing (and WACC).

STNG could change relatively dramatically over the investment cycle, however it would not breach the bounds proposed above that could be set alongside the LTNG. Ofgem might have to factor in transition from current gearing levels and set out principles such that there would be

some certainty over notional gearing in the next price control. However the greater responsiveness to current needs would mean that Ofgem could be relatively confident in endorsing notional gearing for the following five years. Given that Ofgem would not have to allow any further deviations due to individual factors, they could be quite bold in terms of leaving actual gearing in excess of STNG as the responsibility of firms.

A STNG could be used to set the WACC – in effect setting multiple costs of capital in the industry – and would be used in financeability testing, although there could be some difficulties in performing longer-term tests. Using different notional gearings would require additional calculations of the debt premium. This could be performed for a small number of notional gearings or based on a continuum of notional gearings. Criteria for setting a company's notional gearing would have to be constructed in a manner that did not create incentives for gaming or to disguise risky financing.

Option 3: NNG

Ofgem could potentially not set a notional gearing. This strategy might significantly improve credibility of no bailouts, transfer full responsibility for capital structure to companies and encourage companies to finance themselves more appropriately. However this approach may require undesirable methodological shifts in other areas.

Having no notional gearing is not necessarily a problem for setting the cost of capital. On the premise that Miller Modigliani (MM) holds, the cost of capital is unaffected by gearing and therefore would have no impact on the headline return. While it is unlikely that gearing has no impact (the historic use of notional gearing implies that regulators do not believe in MM), it is not clear how material its effect is. This may require further research, but given that companies finance themselves above and below notional gearing anyway, it is not clear it is all that important. Therefore, for example, Ofgem could set a notional gearing for the WACC at 50 percent but state clearly that it does not endorse any particular capital structure. It would be then down to companies whether to appeal the overall price control settlement or not.

With NNG, Ofgem would not be able to perform financeability testing. Instead, given full transfer of responsibility for financial structuring, it would be up to companies to either accept or reject the price control package. Tax sanitisation would have to be across all levels of gearing, or removed altogether.

7.2.4. Evaluation

The benefits of each option set out above would depend on how they are implemented their character would be defined by a number of minor design choices. However their common feature is that they are clear about what notional gearing means. Table 7.5 below provides a brief evaluation of each option.

Table 7.5: Option evaluation

	LTNG	STNG	NNG
Simplicity	May increase complexity	Increases complexity	Reduces complexity
Confidence	Realistic	Realistic	May be risky if "no bailouts" not credible
Regulatory commitment	Strong since a long-term value is being established	While the rule would be simple, the risk that changing gearing values might be influenced by other short-term considerations could limit the degree of perceived regulatory commitment	Not clear, linked to the issue of bailouts
Clarity	Vague about where actual gearing should be at any point in time	Clear	Clear
Transfer of ownership of financial structure to companies	Not automatic inside deviation bands	Yes above STNG due to clarity in each period	Yes if credible
Transition issues	Minor changes	New approaches required for setting the WACC	Could be seen as a major change. WACC may increase if implicit bailouts are removed.
Areas for gaming	Companies may cluster around the edges of Ofgem's acceptable bounds	Maybe in the choice of company-specific NG	Companies may take advantage of the lack of oversight and any remaining implicit bailout

Table 7.5 shows that there is no clearly dominant option. LTNG would be the easiest approach to move to, but without being clear about what gearing movements Ofgem would tolerate over time, much of its benefits might be lost. STNG is probably the most credible and clear approach, but the changes it would require in terms of the way the cost of equity is determined may be out of scale to the problems to be addressed. NNG is a clean and clear approach, but it may be seen by companies and markets as a bolder move than it actually is.

The current notional gearing has elements of each approach, but it would become more powerful if it moved to one of these clearer positions. It could improve Ofgem's credibility and encourage more sustainable financing. Taking a clear position on this issue is important, but which position should be chosen requires detailed consideration of its implications.

7.2.5. Selecting the LTNG option

Table 7.6 provides a summary of the options set out above compared to current arrangements.

Notional gearing appears to be an innocuous part of the regulatory package. However, consideration of how it could be used brings to light a number of ways for it to become a useful regulatory tool. Clarity on the notional gearing can be a neat way to lay down a set of new rules and increase credibility in a number of regards.

If Ofgem want to set out a predictable and principles-based approach to regulation, notional gearing will have to be addressed. It is particularly important with regard to financeability issues and it is likely that a clearer notional gearing would have to look like one of the options set out above. The choice of which type of route to take will reflect their wider implications and reflect the ability for Ofgem to be blind to companies' financial structures, when it is clearly something they currently worry about.

Table 7.6: Option considerations

	LTNG	**STNG**	**NNG**	**Now**
Cost of capital				
Notional gearing nature	Long-term	Short-term, potentially multiple	None	Unclear
Ofgem endorsed deviation bands	Yes, within broad bands around LTNG	No, but could possibly add narrow bands	Free to choose structure but at own risk	Unclear
Can notional gearing vary between companies?	It would be difficult to justify long-term differences between companies, but it could be possible in some cases.	Yes	n/a	No
Can notional gearing vary over time?	Only slightly	Yes	n/a	Yes
New licence obligations relating to gearing requirements?	Potentially in relation breaching deviation bands	No	No	n/a
Might Ofgem ask/tell companies to alter their structures?	Ask and potentially require recapitalisation outside deviation bands	No	No	Unclear
Financeability testing				
Financeability tests	Long-term perspective	Potentially more volatile	Not possible to assess notionally	Medium to long-term perspective
Apply financeability up-lifts if fail financeability tests at notional gearing?	No	Yes	n/a	Unclear
Use finance-ability tests as a cross-check to the WACC?	No	Yes	n/a	Yes
Tax neutralisation				
Tax neutralisation	Could be issues given implied difference between notional gearing stated, and that implied at the time	At STNG or 0 or 100%	Can only sterilise 0 or 100%	Above notional gearing

The ability for companies to hide their financial structures will cause policy mistakes. Therefore the level of asymmetric information on this issue means that there are clear gains to be had from transferring responsibility. However given the implications of a failure for Ofgem and the industry, it remains up for debate whether Ofgem should be agnostic in this regard. This may be reflected in a future stance on notional gearing.

A further consideration that has arisen in this debate is that notional gearing cannot be considered in isolation of tax claw-back mechanisms. However initial examination suggests that current arrangements are rarely biting and that a more effective stance on the tax shield should be considered going forward.[21]

Overall there is probably little to be lost with regards to increasing clarity on the notional gearing, and potentially much to gain. Given the overall long-term approach being proposed we recommend using a LTNG approach.

Given that we believe a LTNG approach is appropriate two further issues need to be considered:

- Should an industry be subject to just one LTNG value? And
- Will that value be updated?

7.2.6. Different LTNG values?

A variant of the LTNG approach has been suggested where more than one LTNG value would exist. For example, high capex companies could face a different LTNG than low capex ones.

We do not believe that more than one LTNG value is needed for an industry since it is designed to capture the differences that exist over an investment cycle – periods when companies will be high capex or low capex. Further, it does not matter if companies within an industry are out of synch with each other relative to their capex intensity since companies are expected to deviate in the short-term from the LTNG and each other.

If there was a reason why some companies faced a different overall level of capex owing to a different exposure to different types of capex – for example, if a gas distribution company had significantly more iron mains as a proportion of existing assets than the others – then there may be a case for considering more than one LTNG value. However, we cannot think of an example like this where a sufficiently large difference would exist for a significantly long time period to justify a different LTNG.

Other factors that could impact on choices would also be considered. For example, a differential exposure to incentives could influence LTNG values.

Were a rationale for a difference to be suggested we would expect Ofgem to review the proposal on the basis of whether:

- an actual significant difference in exposure to capex existed and whether this difference was a long-term issue rather than a short-term one (say more than two price control periods rather than one);

[21] The allowance for a combined cost of debt and tax shield means that the tax shield effect is dominated by the one for the cost of debt. If tax neutralisation of gearing effects is actually required then the cost of debt effect should be removed.

- a difference would lead to a decision by a company to have a different long-term financial structure (say because the form of capex is more exposed to market risk than average capex); and
- that difference was a significant difference in financial structure (say more than 5 percent points).

So, even if a rationale for difference can be found, our basic expectation is that under the proposed regulatory regime the overall degree of regulatory certainty would make the significant differences in risk and financial structure unlikely to occur. However, if the criteria were met then more than one LTNG could be established.

7.2.7. Calculating LTNG

Given the expectation that a LTNG would not change markedly over time, or at least that updates would need to be justified based on fundamental changes, selecting an initial LTNG value would need to be done with care.

As stated in section 7.2.3, we define LTNG to be the long-term efficient level of gearing. The fundamental basis of identifying this level would be to calculate the cost-minimising level of gearing over the life of the regulated assets if financed at a constant level of gearing. This process would not be dissimilar to current notional gearing calculations.

The key to this process would be to establish robust relationships between gearing and the expected costs of debt and equity. These relationships would solve to identify the lowest cost constant level of gearing for an asset. We would impose the boundary condition that the level of gearing would at least need to be consistent with the lowest investment grade credit rating. This process would indirectly involve identifying the lowest cost credit rating, but would not take a particular rating as a starting point.

While the most informative sources for this calculation would come from regulated networks and utilities, this exercise could draw on information beyond this sector to provide a richer evidence base. Information would need to be adjusted to account for regime parameters such as the treatment of tax and the forward looking long-run volatility of cashflows. As forward looking information is richest for each forthcoming price control, short term information is likely to be influential to any calculation. Nonetheless it should be the aim to identify a level that would work for the full asset life, not making unnecessary adjustments for where companies are in their capex cycle and avoiding focussing on just the next five years.

7.2.8. Updating LTNG

Having established an LTNG should it be set in stone? Clearly there are factors that might change the LTNG and a regulator needs the ability to change the LTNG value as events develop.

To ensure that the benefits of the LTNG are as much as possible retained, we would recommend:

- allowing LTNG changes at each price control review;

- requiring any change to be sufficiently large such that changing the rule is warranted – this we believe should be a 5 percent change in gearing, e.g. moving from 60 percent to 65 percent; and
- a clear explanation be provided as to why the change in LTNG is taking place, providing the industry with a chance to appeal the decision if appropriate.

7.3. A signalling role for NG

As noted in 7.2.1, the second possible role for NG is linked to the way in which Ofgem could implement its equity injection policy. There are three possible ways this policy could be implemented:

- Ofgem announces the results of the price determination and leaves it up to the companies to determine an appropriate way of delivering the funding necessary;
- Ofgem announces the results of the price determination and establishes the level of equity adjustment necessary and, in the cases of injections, requires the companies to raise the necessary new equity funds; and
- between these two extremes, Ofgem provides an indication of the amount of equity relative to the NG that would be required but leaves it up to management and the market to determine exactly how the price determination will be funded.

The first approach, while attractive, could lead to concerns about whether the requirement to ensure an investment grade credit rating would be met. At the other extreme, for Ofgem to be able to determine exactly how much equity was required would need them to take a very interventionist line in terms of action and assessment of the true financial structure. This is effectively second guessing the management of the business and could prove to be both costly and difficult to implement – the company will always have better information than Ofgem and consequently mistakes are possible.

Our preferred approach is that Ofgem provides indicative information about the equity injection – based on a set of transparent assumptions, one of which would be the measure of equity injection would be relative to the NG. This allows the regulator to signal to the company and the market that, under certain assumptions, equity is required but leaves it up to the company and market to determine what is actually required.

7.4. Conclusions

Overall the recommendations from this section are:

- formalise the existing situation of a differential WACC based on the time at which the capex took place (not on the basis of differences in risk);
- adopt a LTNG based approach for each industry with a clear and transparent updating process for significant changes in gearing; and
- signal when additional equity is required under a set of explicit assumptions.

If accepted, these recommendations need further development to establish rules and procedures by which they are applied.

8. APPROACH TO CALCULATING THE WACC

One of the key detailed questions raised by Ofgem in its ToR is whether the existing approach to estimating the cost of equity element of the WACC is appropriate. The approach identified in the ToR as that currently used is the Capital Asset Pricing Model (CAPM). As such, firstly we consider the evidence relating to CAPM and then consider whether it is actually the approach employed in UK regulation, and more specifically by Ofgem.

This section also considers other aspects of the way that the WACC is currently determined, including the:

- time horizon of the CAPM calculation;
- incorporation of risk into beta; and
- the use of headroom and a comparison with an alternative approach, used in Australia and New Zealand.

8.1. Is CAPM appropriate

Significant academic debate has existed for many years as to whether CAPM is an appropriate basis to estimate the cost of equity. However, it is not possible to consider this question in isolation since the related question of what alternative should be used if CAPM is not used has to also be considered. In relation to this there are a few alternatives that have been suggested:

- the dividend growth model;
- the Fama-French three factor model; and
- models based on the arbitrage pricing theory.

Our starting point is the Smithers report produced for the joint regulators, which considered the appropriate basis for estimating the WACC. This endorsed the use of the CAPM. Since then the debate has continued and two papers are worth briefly considering.

First, evidence presented at a University of Exeter conference, Conference on Cost of Capital and Financing Regulated Industries entitled Industry Cost of Capital: UK Evidence is supportive of the use of CAPM.[22] This paper compared the predictive capabilities of different approaches to estimating the cost of equity. While a draft paper and so subject to caveats the finding that CAPM results were no worse than those from more complex approaches is an important one.

However, evidence presented to IPART, the multi-sector regulator in New South Wales, Australia, as part of a review of the way in which the cost of equity is determined disagrees with the idea that CAPM is no worse than any other approach. NERA, on behalf of one of the regulated gas companies submitted a review of an NBER paper relied on by Australian regulators to justify the use of CAPM and which shows that the Fama French three factor model is preferable.[23]

[22] Papers are available from: http://xfi.exeter.ac.uk/conferences/costofcapital/index.php

[23] Paper can be downloaded at www.ipart.gov.nsw.au.

What these various papers show is that academic views about which, if any, of the various available models for estimating the cost of equity is still undetermined. As such, if CAPM was the accepted basis at the moment there would be an argument for not changing since the debate continues. However, that would be if CAPM was the only basis on which the cost of equity is decided by regulators in the UK, something discussed in the following section.

8.1.1. Existing UK regulatory approaches to setting the cost of equity

While significant emphasis is placed on CAPM by UK regulators it should also be acknowledged that reality checks are employed using:

- long-term dividend growth model estimates; and
- market evidence such as Market-to-Asset ratios and long-term evidence on the cost of equity.

As such, it is clear that a far from pure approach has been adopted to date and consequently while ensuring that a strong theoretical underpinning exists for the central approach, the use of supporting evidence means that questions about the validity of the central approach are less important. Included in this is the fact that individual elements of the CAPM still need to be determined and significant discretion exists as to how those elements are established. Although Ofgem's consultants have provided detailed analysis of the building blocks of CAPM, Ofgem determinations have just quoted the headline cost of equity range rather than specific input values.

Of course, if conclusive evidence existed as to why an alternative approach was preferable, such as the three factor model, then a shift in the central approach should occur. But, as discussed above, the evidence is not clear. Consequently we cannot see any reason for changing the existing approach of employing a range of approaches to determine the appropriate cost of equity, of which a key approach is CAPM.

8.1.2. Making CAPM more mechanistic?

In the discussion concerning regulatory credibility and commitment earlier it was noted that reduced discretion type rules have been used with respect to the WACC in some countries, especially New Zealand and Australia. This is clearly one way of creating greater commitment. However, as explained above, CAPM is not "right" when estimating the allowed cost of equity, it is just that nothing else has proven better and when linked with other approaches it provides a robust estimate. Consequently, the implications of making the CAPM estimate mechanistic is that while the result will be predictable, it will be wrong.

Of course, being wrong is not necessarily a problem. The market might prefer an approach that is predictable but wrong to one that is less wrong but more discretionary. That would appear to be the case in Australia and lies at the heart of New Zealand's input methodologies. However, we believe that Ofgem's approach to date, while it could be more transparent, has been relatively

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http://www.ipart.nsw.gov.au/files/Submission%20-%20Alternative%20approaches%20to%20the%20determination%20of%20the%20cost%20of%20equity%20-%20Jemena%20-%20Sandra%20Gamble%20-%2022%20December%202009%20-%20APD%20-%20Website.PDF

predictable and probably offers a better solution, especially if the time-frame is considered as we discuss below, to one that would be more mechanistic.

8.1.3. Summary on the continuing use of CAPM

Overall, the use of CAPM as a key part of the establishment of a robust estimate for the cost of equity would seem to still offer the best approach to determining this regulatory allowance. If CAPM were used by itself there would be justifiable concerns and consequently the need for broader market evidence is important. This is in part why while we can see the commitment benefits associated with a mechanistic approach to CAPM and the cost of equity we do not believe this an appropriate way forward for Ofgem.

8.2. CAPM time horizon

Some of the concerns about using CAPM derive from the fact that in the short- to medium-term expected relationships do not necessarily hold. For example, empirical evidence suggests that the underlying risk of the UK regulated sectors, as measured by the asset beta, have been falling since equity betas have been fairly level while gearing has increased.[24] This evidence is surprising, while risk may have fallen through changes to the regimes etc a significant drop is hard to justify. However, if the risk is not falling then there must be something wrong with the expected relationship between gearing and equity beta.

These sorts of concern mean making mechanistic changes to the allowed cost of equity for any determination difficult. Rather a focus on the longer-term cost of equity would seem to be appropriate with more discretionary changes at any price determination to capture changes in risk (discussed below). This would also seem more appropriate given the uncertainty about the precise value of the equity risk premium (ERP) in any five year period – one of the debates at PR09 was whether there is a "crisis" ERP and how that should be incorporated into a forward looking value for the ERP.

A final consideration linked to this is whether there ought to be a clear statement of the way in which gearing will adjust the cost of equity. Given the apparent break in the relationship between gearing and risk it is problematic to allow a mechanistic adjustment for possible changes in gearing.[25] In part we think that can be addressed through the consideration of a longer-term value incorporating the LTNG as the appropriate basis for calculating the efficient cost of equity. Companies are bound to diverge from this value since their gearing will diverge from the LTNG. However, provided the actual gearing level is bounded at a credible level, something likely to occur owing to the need to retain an investment grade credit rating, it is likely that the allowed cost of equity will be appropriate.

So, the robust range determined for the cost of equity should be viewed as one that is appropriate for the longer-term. If changes in risk or other short-term factors need to be addressed this should be done as an adjustment to the longer-term value.

[24] The asset beta of a company is found by multiplying the equity beta by one minus the level of gearing – assuming a zero debt beta.

[25] There may be trigger points where if gearing goes above a certain level then there would be a significant change in the cost of equity. Given gearing levels that regulated companies have been able to achieve it is likely that the trigger point is quite high.

8.3. Incorporating risk

In its January 2010 report Ofgem discusses the proposal that the WACC should reflect the cash-flow risk of the companies being regulated. This raises two questions:

- Which risks should be remunerated through the WACC? And
- Should there be a single WACC for an industry

There is a further question linked to the first which relates to our ability to measure the level of risk and its associated impact on the WACC.

It has been a well established principle that only non-diversifiable risk should be captured through the WACC, efficient investors are able to diversify other risk through the creation of appropriate portfolios. The key aspect arising from this is the need to establish whether risks are non-diversifiable and whether the relative exposure to those non-diversifiable risks is constant across the sector.

While in principle it ought to be possible to assess the relative impact of non-diversifiable risks on the return that companies need – as captured in the asset or equity beta – in practice it is difficult to identify individual effects.[26] As such, even if we can identify the appropriate risks it may not be possible to establish a precise impact. This can also make the determination of whether differences in risk can justify different WACCs for different companies. Unless a material difference in risk exists and that has a material impact on the WACC, the fact any estimate is just that, an estimate, means that differentiating the WACC between companies would not be appropriate.

Consequently, while it is clear that the WACC should reflect the non-diversifiable risks facing the industry, a precise quantification of this is unlikely. Consequently, offering different WACCs to companies depending on their exposure to those risks while in principle correct is something that should only be undertaken if clear and unambiguous material impacts can be identified.

8.4. Quantifying headroom and dealing with the risk of setting too low a rate

A second key element of the approach to estimating the WACC is the issue of where in a range for the WACC the final value should be established. Many UK regulators have adopted a mid-point based approach but ensured that headroom has been provided through setting a risk-free rate that aimed-off above the spot rate. This headroom can be viewed as insurance against uncertainty about future rates.

Similar concerns have been raised in other jurisdictions but phrased in terms of the relative cost of under-estimating the true WACC compared to over-estimating it. While consumers will pay higher charges in the short-term if the WACC is over-estimated, concerns about long-term implications of under-investment occurring because the WACC is under-estimated are seen as being more significant. As such, regulators in New Zealand and Australia have aimed-off from the mid-point of a range to try to ensure that under-estimation does not occur. This can be viewed as effectively the same as an insurance against future uncertainty about rates.

[26] See for example the discussion at the GDPCR about the impact of relative risk.

The approaches adopted in New Zealand and Australia are described below.

8.4.1. NZ Commerce Commission

The Commerce Commission (the Commission) recently released revised draft guidelines on the approach to estimating the cost of capital.[27] In discussing the approach to estimating the cost of capital, the Commission examined issues surrounding the selection of a point along the WACC range.

As a general proposition, it was the Commission's view that the social costs of determining an allowed rate of return that is too low are higher than the costs of setting the allowed rates too high. For this reason the Commission often selects a WACC estimate that is above the midpoint of the estimated range for setting the allowed rate of return. The Commission made the point that the extent of the deviation from the midpoint is assessed on a case-by-case basis.

Factors to take into consideration in making that judgement include the degree of uncertainty in the range and whether the final value seems reasonable in light of industry characteristics and economic conditions. It was suggested to the Commission that a "loss function" could be employed to select an appropriate point. However, the Commission was not in favour of this approach given the lack of empirical data on the loss ratio.

8.4.2. Independent Pricing and Regulatory Tribunal (IPART)

IPART also recently considered the appropriate level of the WACC in its decision on the New South Wales rail access undertaking.[28] IPART notes that in the past it has chosen WACC estimates at various points within the range. Decisions have reflected:

- IPART's view of the likely value of the parameters;
- weighing up the risks of setting a WACC that is too high compared to a WACC that is too low;
- stakeholders' views of the appropriateness of various estimates of the WACC.
- IPART also thought that consideration should be given to the impact of the global financial crisis and its impact on the ability of firms to raise capital.

In a decision in 2005, IPART chose to apply a WACC that was above the mid-point of the range. This rate was chosen to reflect agreement between the stakeholders that a rate of return above the mid-point of the range was appropriate for encouraging new investment. The Australian Rail Track Corporation (ARTC) argued for a rate of return at around the 75th percentile of the range in this case. The arguments put forward were the costs of

[27] Commerce Commission (2009) "Revised Draft Guidelines "The Commerce Commission's Approach to Estimating the Cost of Capital", accessed at http://www.comcom.govt.nz//Publications/ContentFiles/Documents/Revised%20Draft%20Guidelines%20-%20electronic.PDF

[28] IPART (2009) "New South Wales Rail Access Undertaking – Review of the rate of return and remaining mine life from 1 July 2009", accessed at http://www.ipart.nsw.gov.au/files/Final%20report%20-%20NSW%20Rail%20Access%20Undertaking%20-%20%20Review%20of%20the%20Rate%20of%20Return%20and%20Remaining%20Mine%20Life%20from%201%20July%202009%20%20-%20August%202009.PDF

underinvestment; the asymmetric risks faced by ARTC; and consistency with previous regulatory decisions.

IPART's final decision was to set a rate of return that was 60 basis points above the mid-point of the WACC range. This was to account for the risks of underinvestment. IPART noted that based on the available evidence an adjustment to reflect the global financial crisis was not warranted and that compensation did not need to be provided for asymmetric or stranding risks as these were not materially increased by the decision.

8.4.3. A way forward for Ofgem

Should Ofgem consider adopting an approach more in line with those used in the Antipodes? In part this depends on whether:

- indexation is employed which would remove some, or all, of the risk related to uncertainty about future rates; and/or
- headroom is currently provided which is not clear since Ofgem does not explicitly state how the elements of the cost of equity are calculated.

If headroom is included in a discretionary manner it could be appropriate to consider an alternative less discretionary approach, such as those outlined above.

8.5. Conclusions on implementing the WACC

Overall, we believe that:

- a robust estimate of the cost of equity is best provided through a consideration of CAPM with supporting evidence;
- a focus on establishing a robust long-term estimate of the cost of equity accepting the problems associated with short-term estimates;
- an estimate that incorporates non-diversifiable risk and, if material differences can be identified, allows for different WACCs for different companies; and
- a less discretionary approach to headroom unless a form of indexation is applied.

9. ANTICIPATORY INVESTMENT

9.1. Introduction

This section considers the issue of anticipatory investment and more particularly how investments made on an anticipatory basis should be regulated, i.e. the mechanisms for delivering cost recovery and returns on investment, in the context of a regulated asset base (RAV). Whilst it considers anticipatory investment in general there is a particular focus on the treatment of anticipatory transmission investments since this is an area where a clear pressure is already developing.

The section begins by defining anticipatory investment and providing some context to the current discussion. A general discussion of the issues is followed by setting a number of high level options for which the pros and cons are presented. Finally a pragmatic solution to anticipatory investment is proposed which should ensure the delivery of an environment which encourages anticipatory investment (since this is believed to be a good thing) while minimising the burden on consumers.

9.2. Background and context

The Government has set a target of 15 percent as the contribution of renewable energy generation by 2020. If this target is to be met a significant amount of investment in renewable generation will be required and much of this will occur at locations currently not equipped for the transportation of energy. As such investment in the transmission network is required to facilitate achievement of the Government's 2020 targets.

The exact nature of the future generation landscape is as yet unknown, however, given the lead times involved in transmission investment it is likely that if investment were delayed until there was certainty around transmission needs based on generation development an obstacle to generation investment would be created.

Ofgem has stated that its aims for the funding arrangements of anticipatory investment are:

"to ensure that funding arrangements do not create a barrier to the investment needed to accommodate future generation, whilst ensuring adequate protection to consumers where that investment is undertaken on an anticipatory basis. We have also taken account of the prevailing investment climate and interactions with future funding arrangements in reaching our view that, at this stage, a simple pragmatic approach to funding is the best way to ensure that critical investment is not delayed."[29]

The key issue here is that because investment in the network will precede the generation investment there is a risk that the anticipatory investment will not be fully utilised or will not be of the same specifications had there been perfect knowledge at the time of investment.

[29]Ofgem, "Transmission Access Review – Enhanced Transmission Investment Incentives: Final Proposals", 19 January 2010

9.3. General discussion

In developing a funding mechanism to address concerns around anticipatory investment there are three key areas for consideration:

- amount of investment that is at risk;
- speed of recovery of investment costs; and
- allowed return on capital invested.

These issues provide a set of sequential questions which, once answered, provide a straw man funding mechanism. We discuss each in further detail below.

9.3.1. Investment at risk

Typically, for a given amount of installed capacity there is likely to be *ex ante* user commitment for at least a portion of it. If *ex post*, however, the investment proves to have been of greater capacity than required, should the full cost of the investment be recovered and / or eligible to earn a return? If a company is not allowed to earn the full return of capital, how much of the investment should be subject to the risk of stranding?

Further, if a portion of the investment is to face utilisation risk how should success be measured? If the "at risk" component turns out to be always fully utilised then clearly it was never really at risk in the first place and did not require differential treatment. If, on the other hand, capacity is not fully utilised and the full investment cost not added to the RAV then investors do face a materially increased level of risk and will require an increased return in order to provide capital funding.

9.3.2. Speed of recovery

Speed of recovery refers to how quickly the cost of the investment can be recovered from consumers through charges vis-à-vis depreciation. There are a number of sub issues to consider here, although we note there is a separate discussion note prepared on depreciation in the context of financeability.

If, in the first instance, we assume the investment costs are broadly correct in terms of specification and capacity then the typical regulatory approach is to depreciate the regulated for the length of its physical life. However, this may not be appropriate where transmission assets are expected to have significantly longer physical lives than renewable generation assets such as windmills. In such cases, it is the length of the generation assets life that effectively determines the useful economic life of the transmission asset. To depreciate an asset over, say, a 50 year physical life when it has a useful economic life of just 20 years creates issues for inter-generational equity and potentially for the financeability of the asset.

Conversely, if in the example above the transmission asset is depreciated over the shorter 20 year period and the wind farm is then replanted or an alternative use is found for the transmission assets then the book value of asset will be zero but the economic value of the asset will positive with consequent issue again for inter generational equity.

This issue is not unique to anticipatory investment and we do not propose to resolve here.

Turning now to a second scenario whereby the investment (or a significant portion of it) proves to be unnecessary, either due to the subsequent investment in generation not occurring or for some other reason, and assuming that it is not to be stranded then there remains the question of how to recover the investment cost for that portion of the full asset cost that is not required. Should it be depreciated as though were a normal part of the RAV or should there be a writing off mechanism such as expensing the investment cost thus removing it from the RAV and requiring current consumers to bear the cost.

9.3.3. Return on capital

Assuming that anticipatory investment enters the RAV in the same way as regular capex, there is a question as to what rate of return the investment should be entitled earn. That is, should it earn the same return as other transmission asset investments or should there be some recognition of the uncertainty of the investment?

These issues cannot be looked at independently of the views taken on preceding issues, that is, if the funding mechanism were to allow the stranding of assets then anticipatory investment would be seen as somewhat riskier than other transmission capex and this would need to be reflected in an increased allowed return to encourage investment. A particular challenge in this instance, would be assessing how much riskier the investment is and so what level of increased return is justifiable.

9.4. Options discussion

In this section we describe the options for each of the issues discussed above and, in Table 7.1, present the pros and cons each.

9.4.1. Investment at risk

The options available here are broadly binary. Either anticipatory investment that subsequently proves to be unnecessary is stranded or it is not. There is, of course, a hybrid approach whereby only a portion of unnecessary investment is placed at risk. This would not change the direction of any incentives as such, but rather, mitigate their strength.

9.4.2. Speed of recovery

As alluded to previously, the options for speed of recovery can be characterised as either:

- depreciate as per normal; or
- expense that portion of the investment to be written off.

Depreciating as normal effectively treats the asset as though it were fully utilised and no different from any other element of the RAV. Whereas expensing the investment cost would remove the asset from the RAV altogether removing the need to decide upon a basis for how to depreciate and allowing the RAV to be a truer reflection of the value of economically valuable assets.

9.4.3. Return on capital

The options for the return on capital are to:

- set an allowed return that is consistent with other investments in the transmission network; or
- set a separate return for anticipatory investment.

The appropriateness of each option above largely depends on the position reached on the earlier question of stranding. If there is no stranding of anticipatory investments then it is difficult to see how investment of this type differs in risk, from the perspective of investors, from any other investment and so ceteris paribus should earn the same return.

If there is potential stranding of anticipatory investment then clearly these investments are would be relatively riskier for the investor. For investment to take place anticipatory investment would either need to be allowed a higher return or if a common allowed WACC is preferred, this would need to be greater than in the non stranding scenario to reflect the increased risk.

The analysis above assumes that there is a desire to maintain the incentives to invest in both anticipatory and regular capex broadly even. If, however, there was a desire to promote anticipatory investment over other investments with broadly similar risk profiles and recognising the competitive nature of capital markets, then a higher allowed return for anticipatory investment could be one approach to facilitate this.

The options discussed above are summarised below in Table 9.1.

9.5. Options

9.5.1. Differential rate of return

In its Initial Consultation on transmission investment incentives[30], Ofgem proposed a differential return option to address uncertainties over what it referred as asset utilisation risk. Under the proposal delivered capacity that had full user commitment at the initiation of the investment would receive the prevailing price control allowed WACC; delivered capacity that had utilisation in excess of the user commitment would earn a higher return (incrementally); and delivered capacity that was not utilised would receive a lower return.

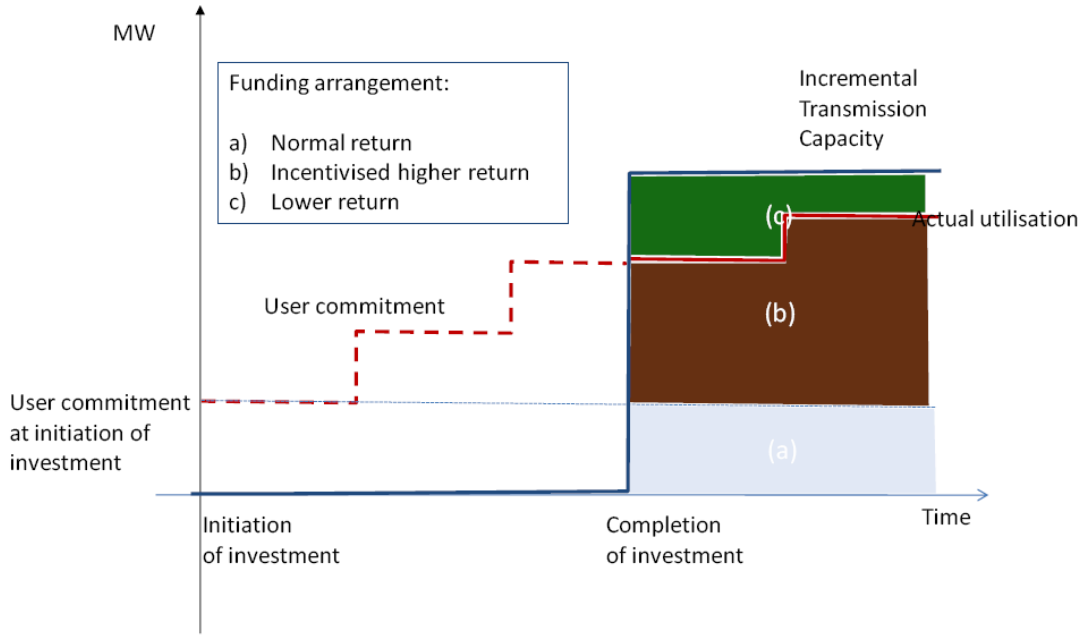
The proposal is sketched out diagrammatically below.

[30] Ofgem, "Transmission Access Review – Initial Consultation on Enhanced Transmission Investment Incentives", December 2008

Table 9.1: Options for funding anticipatory investment

	Investment at risk		**Speed of recovery**		**Return on Capital**	
Option	Stranding	No stranding	Depreciate	Expensing	Common return	Variable return
Pros	This would provide the most comprehensive protection consumers that they pay only for the cost of investment required.	Provides the greatest incentive for investment.	Provides consistency with other transmission asset investments reducing incentives for funds to flow to type of investment over another.	Removes the asset from the RAV so that the asset base is a truer reflection of useful economic assets. Also negates the need to determine a basis for depreciation.	Would enable a common WACC to be applied to the RAV. Eliminates risk of setting the premium incorrectly creating perverse incentives.	Required if materially variable risks (through stranding for example). Could be used as tool to promote anticipatory investment.
Cons	Likely to act as a strong disincentive for investment until the strongest of commitments from generation developers are in place (including planning permission etc) thus delaying the bringing online of renewable energy.	Little protection provided for consumers in the event that investment proves to be not required. Places heavy reliance on the *ex ante* judgement of Ofgem and its consultants.		Limits the options available should the asset prove to be useful at a later date.		

Figure 9.1: Potential; incentive mechanism to reflect asset utilisation risk



Source: Ofgem

Responses to the enhanced incentive mechanism were mixed with the Scottish TOs, in particular, unsupportive of such an approach. In the event, Ofgem did not proceed with the proposals, opting instead for a "simple, pragmatic approach." Whilst one reason for this to allow for consistency with the RPI-X@20 workstream, concerns regarding a differential return approach were also raised. These included doubts over the state of capital markets and ability to raise finance in the face of greater uncertainty and also fears that the process of defining and agreeing the parameters of the enhanced incentive mechanism with TOs would ultimately have the unintended consequence of actually delaying investment rather than encouraging it.

9.5.2. Phasing of anticipatory investment

Below we consider a solution which, presuming anticipatory investment is something that should be encouraged, builds on the positive principles outlined above but which also limits the exposure of customers to significant anticipatory investment costs. If the approval of capex could be broken down into a series of relatively discrete "phases", capex triggers might be employed to remove stranding risk on each pre-defined "phase" of anticipatory investments.

Phasing of investment

Investments can often be broken down into a series of consecutive "phases." For example, stages such as pre-planning and planning work must be completed in anticipation of an investment being realised on the ground. These stages are risky and may start far in advance of actual needs coming to light. These stages are ultimately "sunk" and valueless if the project does not go ahead. However, it may be efficient in some cases to undertake these initial activities and stop greater value being lost if the whole project went ahead. Stranding this investment would damage incentives for companies to act in an anticipatory manner. However allowing the full

investment to go ahead is an inefficient use of resources at the expense of consumers. Consequently the efficient solution may be to provide a series of "cut-off" points at which costs already incurred by companies can be recovered, but any additional expense is abandoned. Cut-off points could be introduced at key "trigger" points such as at achieving planning permission.

As well as dealing with problems of whether a project should go ahead or not, phasing investment is a useful mechanism to ensure that costs are recovered as they are incurred. This improves cost reflectivity and is particularly useful for projects with unpredictable timelines.

We note that Ofgem's approach to funding the Western HVDC link project could be considered consistent with this approach. In that instance, Ofgem opted to not *ex ante* fund the full construction costs of the project due to doubt over the certainty of the need for the investment. Instead, funding of pre-construction costs and the Deeside substation were agreed. The substation was viewed as being necessary for the timely completion of the project should it go ahead.

Capex triggers

Essentially a capex trigger defines the conditions under which capex will be added to the asset base and become eligible to earn a return on and of capital. The trigger may be defined by milestone dates, official approvals, usage or demand drivers or, indeed, any pre-defined set of conditions set down by the regulator.

Although not currently widely used in UK regulation there is precedent from the aviation sector where the CAA, after consultation with the asset owner BAA and airlines, proposed a series of capex triggers for the investment at Heathrow. Whilst the context for the investment could be argued to differ from that for networks, in that it was widely believed that demand for the assets already existed, their proposals provide a useful example to how to deal with uncertain investments. Triggers had been used during Q4, the last price control period, linked to T5 and investments in Gatwick. While the precise example provided below was not implemented as a trigger by the CAA, BAA and the airlines agreed to effectively act as though a series of triggers had been implemented.

BAA and an airline working group proposed that investment in the Project for the Sustainable Development of Heathrow (PSDH, which comprises T6 and the third runway) could be recovered through increased charges on achieving a series of observable capex triggers.[31] This proposal was designed to ensure that charges reflected reasonable costs incurred, but that prices would not rise if the government did not back any further development or if other delays occurred (such as hold-ups with planning permission). Effectively this would mean that anticipatory investment would be incorporated as each phase was implemented. Four events would trigger a pre-defined increase in Heathrow's allowed airport charges and cumulatively recover the full expense of investment. BAA's proposed stages are set out in Table 9.2 below.

[31] CAA (2008, March) "Economic Regulation of Heathrow and Gatwick Airports" 2008-2013: CAA decision" http://www.caa.co.uk/docs/5/ergdocs/heathrowgatwickdecision_mar08.pdfhttp://www.caa.co.uk/docs/5/ergdocs/heathrowgatwickdecision_mar08.pdf

Table 9.2: Proposed BAA capex triggers

	Trigger	Costs	Incremental capex
1	Government policy statement	This would coincide with planning process spending, initial planning, design and land acquisition	£299m
2	Declaration of intent to apply for planning permission	Triggers residential property market support bond costs	£170m
3	Airspace change approval	Infrastructure construction costs	£97m
4	Planning application goes to public enquiry	Further design costs	£73m

Alongside the stages proposed in Table 9.2, they would also hold an annual consultation between BAA and airlines to agree costs, Heathrow expansion activities and airport charges.

The CAA ultimately rejected this proposal based on two doubts:

- that triggers could be objectively measured with an unequivocal test of success; and
- that the optimum capital programme will be sufficiently predictable.

They instead decided to introduce *ex post* tests on whether expenditure was necessary at the time it was incurred. This policy would have many of the same effects, but potentially at the expense of regulatory certainty.

Ofgem's anticipatory investment problem has many similarities to CAA's, but there are sufficient differences that BAA's solution could work in the case of networks. Assessing this would require close consideration of network project development cycles. Ofgem could for example consider a simple approach with just one or two triggers, for example at initial approval by Ofgem and then at achieving planning permission. These could deliver most of the benefits of phasing without introducing much complexity – especially as the greatest uncertainty is linked to planning permission and it is the need to ensure that this is available that makes the investment anticipatory (for example, the actual time to build the transmission line to a new generation site could be less than the time required from the successful completion of planning permission for the new generator to the completion of construction).[32] In certain cases it may be valuable to have several triggers put in place.

9.6. Hybrid volume risk option

A potential hybrid option that would expose transmission companies to greater volume risk than the phasing approach whilst retaining the simplicity of a single allowed rate of return would be to include capacity utilisation related revenue drivers. The key elements of such an approach are sketched out below:

[32] Even if longer was needed for the building of an investment, once planning permission is being sought by a generator it may be possible to consider an investment less anticipatory, or at least justify the next phase of an investment beyond the planning permission stage.

- *ex ante* capex allowances for pre construction costs such as achievement of planning consents;
- inclusion in the RAV of capex incurred in the delivery of capacity for which there is user commitment;
- a £ per MW capacity utilisation driver for capacity utilised in excess of user commitment for the remainder of the price control period (or alternatively for a rolling 5 or even 10 year period depending on desired strength of incentive); and
- capex incurred in the provision of additionally utilised capacity transferred to the RAV at the next price control review.

There are some obvious challenges in implementing the above; determining both the *ex ante* automatic allowances for pre constructions and the appropriate £/MW for the volume driver would likely involve considerable consultation if the desired result is to be achieved. However, the spirit of the approach appears consistent with set of specific tools set out Ofgem in the RPI-X@20 working paper, "Delivering desired outcomes: Ensuring the future regulatory framework is adaptable."[33]

9.7. Conclusion

There is a great deal of uncertainty around both the specification and capacity of investment in the transmission network that is required to meet the 2020 renewable generation targets. The combination of a no stranding policy and the long lived nature of the assets mean that any investment that occurs will, ceteris paribus, be paid for by consumers for decades to come.

Creating an environment which encourages anticipatory investment is clearly necessary given the pivotal role that it plays in delivering the low carbon energy future, and consequently a strong commitment to a no-stranding policy and an appropriate time period for recovering the investment (earning an appropriate return on the investment until it is fully recovered) is needed. However, this needs to be controlled so that the cost to the consumer is as low as possible – while not damaging the basic environment being created. One option to mitigate the risk to consumers that this overall approach presents is the introduction of "capex triggers" which would:

- break down the required investment into a series of phased capex projects; and
- require that a set of *ex ante* conditions agreed between the transmission companies, users, generators, Ofgem and other stakeholders be met before capex is added to the regulated asset base.

This should at least ensure that the minimum cost is being imposed on consumers while ensuring conditions that will encourage the timely provision of the necessary investments.

[33] Ofgem, "Delivering desired outcomes: Ensuring the future regulatory framework is adaptable", October 2009

10. CALIBRATING INCENTIVES

One of the key new tools used for DPCR5 was the Return on Regulated Equity (RORE). This provided an opportunity for assessing:

- actual returns earned by shareholders as the residual investors into the businesses; and
- a breakdown of the sources of the actual returns.

As such this is a very powerful *ex post* tool for informing regulatory decisions. A further use employed at DPCR5 was also as an *ex ante* tool for calibrating elements of the regulatory determination.

This section is concerned about the total impact of incentives and penalties around the allowed return, not the way that the individual incentives are set – although a brief initial discussion of this issue is provided. There are clearly issues that Ofgem needs to consider with respect to the way individual incentives are calibrated which includes greater use of consumer willingness to pay evidence, but this is outside the scope of this report.

Note, when talking about calibrating returns we mean establishing upper/lower limits for the impact on returns – so the basis for the individual incentives is separate (and briefly discussed above) the remainder of this section is concerned with establishing the likely impact of plausible scenarios for the package of incentives on an efficient company.

10.1. Setting individual incentives

Determining an appropriate basis for individual incentives is far from straight-forward. Ideally a system based on customer willingness-to-pay for the improvements/services associated with the incentive would be an appropriate basis for calibrating an incentive payment. Then, provided the incentive is set no higher than the willingness-to-pay it would be possible to allow the incentive to be uncapped. Of course, if the willingness-to-pay is expected to drop over time then setting a cap at the point where customers change their valuation would make sense.

However, few if any of the incentives set by Ofgem incorporate willingness-to-pay data. As such, the values of the incentives are set on the basis of Ofgem's analysis or proposals by the companies. Accordingly the risk of providing perverse incentives to companies to over-invest or provide the incentivised activity would be greater than under a situation where customers had expressed their views. Consequently placing a cap on the amount of an individual incentive would be appropriate. The level that this incentive cap should be set at would depend on the activity being incentivised, the size of the individual incentive (both absolute and relative to the likely cost required to deliver the activity) and any interactions likely with other incentives/ aspects of the revenue determination.

10.2. Role of RORE

It is this second, *ex ante*, role that is the primary focus of this section of the report. Should RORE be used as the basis for setting the possible range of returns and if yes, at what level should the forward looking possible range of RORE be set?

There are obviously two possibilities for calibrating returns. This can be done either on:

- total returns (i.e. the WACC); or
- RORE.

Clearly the two measures are linked and, as such, it does not matter overly which is the focus. However, for simplicity and transparency it may be better to focus on the RORE since this also sends a clear message about the treatment of debt.

For example, if RORE can be negative then it is clear that the return to debt holders is viewed as at risk on an *ex ante* basis. However, if RORE cannot be set below zero on a forward looking basis then the regulator is sending a message about the cost of debt (for a notionally geared company) is not at risk. Of course, in actuality whether the cost of debt is met will depend on both the *ex ante* determination and the actual performance of the management, but the latter is what is being incentivised.

For DPCR5 the forward looking calibration was based on RORE not going below zero.

Should an upper bound also be set? While again in reality the actual returns that a company can earn will depend on both the incentives and the management's ability to respond to them, should incentives be capped?

This in part depends on the way in which incentives are set. If they are decided through negotiation between Ofgem and the company then it is probable that some form of overall *ex ante* cap would be helpful to ensure that any asymmetry of information problems do not lead to significant excess returns for companies. If the incentives are set on the basis of the value that consumers place on receiving an additional service or quality aspect then capping may not be important – since consumers will still be benefitting from the additional supply of the service.

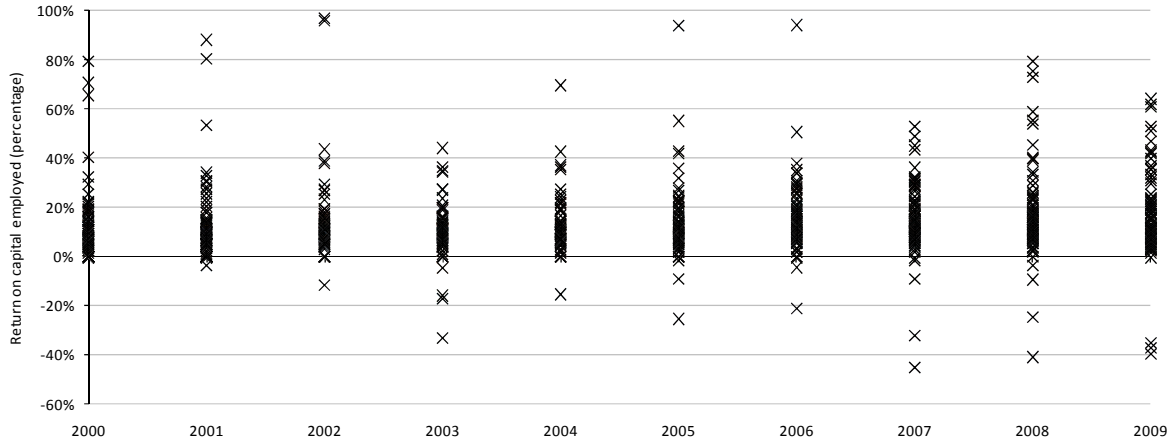
10.3. Comparable industry data

When deciding the basis for calibrating the overall returns for companies it is useful to consider external evidence from competitive industries since a key principle underlying regulation is the proposal to mimic competition. Evidence on *ex ante* returns are however very limited and consequently it is necessary to use actual returns. Obviously there are many problems with actual returns including survivorship bias. Further, the use of information from non-regulated businesses makes comparisons using RORE difficult. Standard returns on equity (ROE) as reported by listed companies are also not comparable (the closest would be returns on the market value of equity but this data is not so easily available).

Consequently we have focused primarily on a return on capital employed (ROCE) although ROE has been used more to consider the incidence of negative returns than the overall calibration of appropriate returns. We have used a sample of 95 companies from across Europe and focused on capital intensive industries – including utilities and infrastructure. 10 years worth of data is available for this set of companies.

Figure 10.1 shows the annual ROCE earned by each of the company in this sample, illustrating the distribution of returns over time. As can be seen, the range is broad and can change from year to year. Further information on ROCE and ROE for this sample is provided in Annex 2.

Figure 10.1: Return on capital employed for a sample of 95 capital intensive companies (2000-2009)



This data shown above and in Annex 2 illustrates the fact that in more competitive industries:

- seldom are negative total returns earned and although more frequent, negative equity returns are still unusual;
- results are bunched around an average value, but the influence of the extreme positive and negative values means that the standard deviation is a poor measure of the dispersion and an inter-quartile range is preferable; and
- the range for ROE would include negative values if based on the average and standard deviation but would stay positive if based on the median and inter-quartile range.

Accepting a lower bound at zero would be in line with the data and would also send a strong signal about meeting basic financial costs. It also does not remove the risk that a company would actually not be able to meet its cost of debt but that should only be due to management inefficiency. This would make the probability of continued losses small, which is consistent with the evidence, but does not eliminate the possibility.

10.4. Principles for calibrating incentives

While care has to be taken in interpreting the information from this database, there are some aspects that can help inform the principles that Ofgem should follow when setting expected forward looking ranges. These are:

- a focus on RORE is appropriate;
- setting a minimum expected value of RORE over the whole life of a control is appropriate and this should be at zero, so the expected ability to meet at least the cost of debt exists (although this is on average, not specifically in each year); and
- setting a maximum expected value depends on the way that incentives have been set. If appropriate having a symmetrical range about the allowed ROE would be appropriate, although this would be a broad range if the lower bound is zero.

Insufficient information is available to provide more precise upper bounds for the RORE although it should be possible to refine the available information over time.

11. PHASED IMPLEMENTATION

Any decision to change the basis for setting one or more of the building blocks for price control determinations needs to be considered with respect to its short- to medium-term implementation implications. Specifically, having established one approach there is the risk that a sudden change to another approach will:

- create uncertainty for investors which is counter-productive as it potentially leads to higher prices for consumers; and/or
- exacerbate an existing issue through the removal of the support without providing time for an alternative form of support to be provided.

The concern has to be that in either case prices might rise and/or investment may be delayed. These would hurt consumers and consequently should be avoided if at all possible.

Even if a clear statement about the new policy is provided there is a risk that short-term problems could arise. Moving away from a short-term focus to a long-term focus, with equity acting as the bridge between the two rather than cash-flow advancement linked to costs, could create problems if:

- existing investors value the income stream that is being provided by the investment and are not prepared to subscribe to new equity; and/or
- it requires time for the companies and the markets, via intermediaries including credit rating agencies, to establish guidelines as to how the new policy will be implemented by the companies.

The former problem, if it exists, should disappear over time. The mix of investors can change from income to growth-focused funds, but this would require prior warning for an orderly change to occur. A rapid change could lead to chaotic exits by some investors, depressing share prices and imposing additional financing costs on the industry. If the transition is managed such that investors are well informed in advance of any changes, there should not be a concern about damaging returns to investors and consequently an environment which encourages investment would continue to exist.

Of course, there are benefits associated with a fast implementation in new policy. For example, it: (i) signals a clear commitment to the new policy; (ii) minimises any complexity that could arise from a phased implementation; and (iii) allows companies to raise equity at a time when it is needed. As such, the costs and benefits need to be weighed-up as part of a consideration of whether a transitional period is necessary and to establish how a transition might be handled.

11.1. Impact of changing the depreciation charge

It is clear that the current arrangements in electricity and gas distribution provide companies with significant additional cash-flow through different forms of accelerated depreciation. This is at a time when the capex programme is increasing above trend and is likely to stay above trend for the foreseeable future. Consequently, there is a valid concern that problems could arise if a shift to using equity as the correcting element rather than advancing revenues. This concern is

irrespective of whether the shareholder base would need to change and a suitable time frame is established for that to happen in an orderly way.

To consider whether this concern is appropriate we have modelled the impact of changing the depreciation policy from a 20 year life to a 40 year life for the whole of the DNOs. A high-level model has been established for this. The impact on key financial ratios is shown in Table 11.1.

Table 11.1: Financial impact of depreciation policy[34]

	20 year depreciation		40 year depreciation	
Years	**2016 -2020**	**2021-25**	**2016 -2020**	**2021-25**
Total FFO	18,000	20,800	13,900	17,600
Average FFO / interest	3.99	4.17	2.70	2.43
Average gearing	58%	55%	63%	64%
Average PMICR	1.70	1.78	1.55	1.48

Source: CEPA modelling

The modelling is obviously dependent on the assumptions utilised and table 11.1 provides a summary of the impact under one specific assumption about future investment needs (the least aggressive of our scenarios for the short-term, but still aggressive compared to the history of capex in the sector). What the scenario shows is a worsening of the key ratios we have identified and a corresponding increase in gearing needed to meet the investment requirements. Whether the ratios for the sector as a whole are sufficiently poor to cause a financeability problem is not entirely clear – but the levels would be below those traditionally accepted by regulators.

Of course, by considering the sector as a whole we lose the distribution of outcomes that would be seen with individual companies. Further information on individual companies (four anonymous companies) is provided below to give some indication of the spread of impacts within the sector.

11.2. Impact of the new policy

An alternative way of considering the possible transitional impact would be to consider the implications of the complete new package if applied for DPCR6. Illustrative results are provided in Table 11.2 considering the total equity injections required under three scenarios.[35]

Table 11.2 illustrates the impact of three different scenarios relating to the future level of investment – "flat," "hump" and "mountain." Each describes a stylised path of future spending and the corresponding illustrative level of equity injections required is shown. The results show that injections may be large for some companies, with over 150 percent of 2010 closing RAV being required in some cases under high capex growth scenarios. This estimate may be conservative for some companies but must be interpreted as being required over a 40 year

[34] Assumptions include a flat spending profile over the period and dividends being paid at five percent of equity RAV.

[35] Modelled equity injections are made at the start of any five year period when either of the financial ratios thresholds listed are breached. Please note that the selection of the specific financial ratios and thresholds to be tested is designed to be illustrative, that injections could be equally made on a more frequent basis, and can be designed to achieve any set of financial ratio requirements. Also note that the total injections over the period are scaled by 2010 closing RAV, and therefore do not reflect RAV growth over time.

period, and realising that some companies may require no injections at all. This is reflected in the whole DNO block of data at the end of the table.

Table 11.2: Total five yearly equity injections required to maintain specified PMICR ratios (2015-2045)

Annual dividend assumption	Financial ratio lower bound	Total five-yearly injections (2015-2045) expressed as a percentage of 2010 closing RAV					
	PMICR	Expenditure scenario[36]					
		"flat"		"hump"		"mountain"	
		Initial	Ongoing	Initial	Ongoing	Initial	Ongoing
Company 1							
5% equity RAV	1.6 times	**30%**	20%	**30%**	45%	**30%**	110%
None after 2011	1.6 times	**25%**	0%	**25%**	0%	**25%**	0%
5% equity RAV	1.3 times	**10%**	0%	**10%**	10%	**10%**	5%
None after 2011	1.3 times	**5%**	0%	**5%**	0%	**5%**	0%
Company 2							
5% equity RAV	1.6 times	**5%**	5%	**5%**	25%	**5%**	50%
None after 2011	1.6 times	**0%**	0%	**0%**	0%	**0%**	0%
5% equity RAV	1.3 times	**0%**	0%	**0%**	0%	**0%**	0%
None after 2011	1.3 times	**0%**	0%	**0%**	0%	**0%**	0%
Company 3							
5% equity RAV	1.6 times	**30%**	20%	**30%**	45%	**30%**	130%
None after 2011	1.6 times	**20%**	0%	**20%**	0%	**20%**	0%
5% equity RAV	1.3 times	**15%**	0%	**15%**	15%	**15%**	50%
None after 2011	1.3 times	**10%**	0%	**10%**	0%	**10%**	0%
Company 4							
5% equity RAV	1.6 times	**0%**	0%	**0%**	25%	**0%**	70%
None after 2011	1.6 times	**0%**	0%	**0%**	0%	**0%**	0%
5% equity RAV	1.3 times	**0%**	0%	**0%**	0%	**0%**	0%
None after 2011	1.3 times	**0%**	0%	**0%**	0%	**0%**	0%
Aggregated DNO data							
5% equity RAV	1.6 times	**5%**	10%	**5%**	35%	**5%**	90%
None after 2011	1.6 times	**0%**	0%	**0%**	0%	**0%**	0%
5% equity RAV	1.3 times	**0%**	0%	**0%**	0%	**0%**	0%
None after 2011	1.3 times	**0%**	0%	**0%**	0%	**0%**	0%

[36] Expenditure scenarios correspond to three artificial profiles projected from 2016 to 2050 based on the preceding five year average:

- "Flat" – expenditure remains flat for the whole period;
- "Hump" – peak in 2030 at 140 percent, before falling to 40 percent of current levels in 2050; and
- "Mountain" – expenditure grows constantly to reach 220 percent of current levels in 2040.

While modelling highlights the importance of future spending on the scale of injections required, it also highlights two ways in which their need could be reduced:

- **Use of retained earnings.** Regulators including Ofgem tend to set a dividend payout assumption as part of their determinations. Ofgem set a payout rate of five percent of regulated equity at DPCR5. While Ofgem should not attempt to set actual dividend policies, modelling shows that much, if not all the additional equity needs for some companies could be met through reducing dividends. While companies may prefer to take a more balanced approach, this provides a powerful alternative or complement to injections for management and investors to consider.
- **Flexible ratios.** While credit ratings and financeability must not be hung on mechanistic performance against a set of financial ratios, modelling shows that equity injections are significantly reduced as these hurdles decrease. Even if a ratio was what credit rating agencies have normally required the company to meet, given a new longer-term focus there would be an incentive on the management of the company to work with credit rating agencies to agree greater flexibility provided certainty about long-term returns being sufficient existed. This may be a strong incentive on the company and, as seen with Phoenix Natural Gas, a company where some of the returns are deferred has been able to work with the credit rating agencies and establish a credible position that supports an investment grade rating.

Despite these strategies, some companies may require all new investment being equity funded and/or some of their existing debt being replaced with equity.

11.3. Possible solutions to a transition problem

Three possible solutions to the transition problem could exist. These are:

- provide short-term revenue adjustments to allow internally generated funds to be deployed and for sufficient time for the market to be prepared for significant equity injections;
- implement the key policy change of depreciation lives in a phased manner; or
- provide no short-term relief.

The latter is effectively what Ofwat has done in PR09 (see Box 11.1) and while the number of companies that have been told that equity injections are necessary to cover financial ratio issues at least one of these was a significant injection (£500m for Thames Water). Continuation of investment is as important for the water industry as it is for energy yet Ofwat did not feel obliged to provide a transition period – in part because the output requirements are sufficiently strong to provide a backstop against non-delivery of capex. This approach is effectively being tested through Bristol Water's appeal to the Competition Commission.

Box 11.1: Ofwat PR09 equity injections and issuance costs

As part of its PR09 determination, Ofwat included equity injection assumptions for three companies:

- Thames Water – 20 percent opening notional equity;
- Bristol Water – 10 percent opening notional equity; and
- South East Water – 7.5 percent opening notional equity.

These injections were supported by an allowance to cover equity issuance costs at a rate of five percent of the modelled equity to be raised. These costs will be clawed back by Ofwat if they do not issue equity during the price control.

The above companies were identified as needing equity injections as a result of the impact of their large investment programmes on their financial ratios. Indeed, these were the three companies with the largest RAV projections. The financeability standards against which these companies were tested are summarised in Table 11.3.

Table 11.3: PR09 Financeability ratios

Ratio	**Water and sewerage companies**	**Water only companies**
Funds from operations to gross interest	About 3 times	About 3.5 times
Funds from operations less capital charges to net interest	About 1.6 times	About 1.8 times
Funds from operations to debt	About 13 percent	About 17 percent
Retained cash flow to debt	About 8 percent	About 10 percent
Net debt to regulatory capital value	Below 65 percent	Below 60 percent

This approach was consistent with Ofwat's view that:

> "We remain of the view that equity injections or rights issues are legitimate means of easing the financing constraint brought about by continuing large capital programmes. This is particularly the case where new equity supports RCV growth for a company operating under a stable regulatory regime."

Despite this, and the fact that injections did not have to be made, they were not well received by the companies. Equity injections have been raised as an issue by Bristol Water in their appeal to the Competition Commission. South East Water has stated that they do not believe that injections are a suitable response, and that it provides a "get out of jail card" for Ofwat. It is not clear that these criticisms are valid. Clarification will be provided in Bristol Water's referral.

Source: Ofwat (November 2009) "Future water and sewerage charges 2010-15: Final determinations" Section 5.6.2
http://www.ofwat.gov.uk/pricereview/pr09phase3/det_pr09_finalfull.pdf

If transition adjustments are provided, on what basis should this be? What is clear is that the existing approach of accelerated depreciation is not appropriate given the long-term inter-generational equity implications. Rather, a focus on short-term NPV neutral revenue advancement would seem to be appropriate. For a five year period sufficient revenue to meet short-term targets could be advanced but on the understanding that this would be unwound in the following five year period. Whether this is done in conjunction with increased equity retention – so a reduction in dividend payments – would depend in part on the size of the problem.

Is one period sufficient? Five years for the industry to prepare itself would seem to be sufficient, although this does again depend on views about the size of the investment programme. If it is sufficient Ofgem will need to decide whether DPCR6 is the first review to be undertaken with the new approach or whether it is the last to have the transitional support available. Determining which of these is right will depend on several factors:

- the results of the Bristol Water appeal;
- ongoing modelling on the industry implications and the likely investment profiles;
- responses to the consultation on financial issues; and
- further discussion with the City.

Box 11.2: Ofgem TPCR4 equity injections and issuance costs

As part of the TPCR4 review, Ofgem modelled equity injections to determine *ex ante* equity issuance costs required over 2007-12. Ofgem had previously indicated that should a company not be able to maintain an appropriate credit rating, they would support the raising of new equity through a notional allowance for equity issuance costs. The decision to allow issuance costs on an *ex ante* basis (which they would then "true up" at the following review) required forecast equity injections to be modelled as part of the price control determination.

This exercise found that SPTL would require injections of up to £43m, and SHETL would require between £39m and £165m. Equity injections were calculated such that companies would achieve certain thresholds based on the following three financial ratios:

- debt to RAV (gearing);
- funds from operations to RAV; and
- funds from operations plus interest to interest.

The transmission models published alongside the determination give some insight into the ratios Ofgem tested in the review. Table 11.4 shows the financial ratios embedded in these models.

Table 11.4: TPCR4 Financeability Ratios

Ratio	Electricity	Gas
Debt to RAV	Below 70 percent	Below 68 percent
Funds from operations to RAV	Above 9 percent	Above 10 percent
Funds from operations plus interest to interest	2.7 times	3.0 times

When two or more of the above ratios were materially below thresholds that ratings agencies believed would achieve at least a BBB+/Baa1 rating in 2012, or in any year in which gearing exceeded 60 percent, an injection would be triggered that would bring these measures back into line. Following re-profiling and tax adjustments, an assumed equity issuance cost of five percent was applied. This resulted in equity issuance costs of £1m being allowed for SPTL and £5m for SHETL, implying expected equity injections of £20m and £100m respectively (approximately the mid-points of the modelled equity injection ranges).

Source: Ofgem (December 2006) "Transmission Price Control Review: Final Proposals" Sections 8.30 to 8.40 and Appendix 2 sections 1.53 to1.59:
http://www.ofgem.gov.uk/Networks/Trans/PriceControls/TPCR4/ConsultationDecisionsResponses/Documents1/16342-20061201_TPCR%20Final%20Proposals_in_v71%206%20Final.pdf

11.4. Supporting equity injections

As shown in Box 11.2, Ofgem allowed transmission companies to recover the cost of equity issuance in the TPCR4 determination. Ofwat followed suit at PR09, also applying a five percent allowance on modelled equity raised (to be adjusted to actual levels at the following determination). While evidence must prove the effectiveness of these policies to promote strong corporate structures, supporting equity injections through issuance allowances appears to be a useful way forward. We recommend taking this approach but with the important difference of calculating issuance allowances on an *ex post* basis with logging-up based on equity raised. This alteration has the following benefits:

- **Ensures management ownership of corporate structure.** *Ex post* allowances do not require detailed modelling of forecast equity injections recently performed by both Ofgem and Ofwat. A regulator's *ex ante* equity injections can interfere with management decisions regarding the appropriate capital structure. *Ex post* allowances allow the regulator to maintain a neutral stance on capital structures and do not require financeability testing on terms defined by the regulator.
- **Equitable equity injections.** *Ex ante* allowances only apply to those companies deemed to require equity injections. *Ex post* allowances do not prejudice more stable companies wishing to raise equity by allowing all companies to recover the cost of equity issuance, not just those identified by the regulator.
- **Reflects uncertainty.** The need for equity injections depends both on factors that can be modelled and those that cannot, including the propensity to raise or retain equity. An *ex post* allowance avoids the need to generate an inaccurate but influential forecast.

Scottish TO arguments persuaded Ofgem to set an *ex ante* allowance at TPCR4 on the basis that an *ex post* approach would increase regulatory uncertainty. It is not clear however that this is either materially the case or that it would outweighed by the benefits set out above.

Ongoing questions for this approach will be with regards to the appropriate issuance cost incentive rate and how it may be supported in the transition period, as well as how this will interact with the cost of capital.

11.5. Proposed way forward

Good practice and pragmatic concerns mean that signalling a major change in policy and providing sufficient time for the new policy to become understood and implementable are important. As such, a transition period should be implemented with DPCR6 being the cut off – this would mean that both the forthcoming transmission and gas distribution reviews would continue to implement a form of revenue advancement. We believe that implementing the new policy from DPCR6 would be appropriate but further analysis of this proposal is necessary. For example, how significant an issue would implementation of the new policy be for the forthcoming transmission and gas distribution reviews? This would, in part, depend on the scale of investment requirements, implications of a shift away from expensing 50 percent of the iron mains replacement capex and the fact that, at least for transmission, there has already been some

requirement for new equity funding. It will also be important to see if the Competition Commission makes any recommendations with respect to Bristol Water and Ofwat's requirement for equity injections as it completes its inquiry.

ANNEX 1: THE AUSTRALIAN ENERGY REGULATOR'S APPROACH TO SETTING THE WACC

In Australia, a National Electricity Market (NEM) has been established covering the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria. The NEM includes the wholesale electricity market and the associated transmission and distribution network. Australia's National Electricity Market (NEM) is subject to a national framework of economic regulation under the National Electricity Rules (NER). The Australian Energy Market Commission (AEMC) has responsibility for determining the NER while the Australian Energy Regulator (AER) has responsibility for the enforcement of the rules and for the economic regulation of transmission and distribution networks in the NEM.[37]

Under the NER there is a high degree of regulatory certainty about the weighted average cost of capital (WACC) to be used in regulatory determinations by the AER. In particular, the framework for determining the WACC is fixed. This includes the decision that a nominal post-tax framework will be applied and that the cost of equity will be determined through application of the capital asset pricing model (CAPM).[38]

The role of the AER is then to conduct a review every five years to determine the particular parameters that will be applied to estimate the WACC for reset determinations relating to electricity determination and distribution network service providers (TNSPs and DNSPs). The AER may review the values or methods of setting the following:

- gearing ratio;
- nominal risk-free rate;
- expected market risk premium;
- equity beta;
- credit rating levels to calculate the debt risk premium (DRP); and
- assumed utilisation of imputation credits (i.e. gamma) used to calculate corporate income tax.

In reviewing each WACC parameter, the AER is required to have regard to, amongst other factors, the need for the rate of return to be commensurate with the existing conditions in the funds market and the risk involved in transmission and distribution. The rate of return needs to be forward looking.

For transmission, once a determination has been made by the AER on the parameters these are "locked in" for all determinations until the next WACC review. For distribution, the same is true except in the case that there is persuasive evidence to suggest a departure from the parameters. The AER made the first of these parameter determinations in May 2009. The parameters and

[37] CEPA (2009) "Review of IPART's approach to incentive based regulation – Final Report – Annexes"

[38] Details of the AER's approach are drawn from AER (2009) "Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC)", accessed at http://www.aer.gov.au/content/item.phtml?itemId=728179&nodeId=7132da8433cd448d2f8e4f11c02be5bb&fn=Final%20decision%20(1%20May%202009).pdf

assumptions that will be applied by the AER in determining the WACC are set out in Table A1.1.

Table A1.1: WACC Parameters under the AER's review

Parameter	Assumption
Bond maturity period	10 years
Gearing	60 per cent
Equity beta	0.8
Market risk premium	6.5 per cent
Credit rating	BBB+
Nominal risk-free rate	Calculated as the yield on ten year Commonwealth Government Bonds calculated over the five year period from 1 April 2004 to 1 April 2009 (i.e. 5.68 percent).
Return on equity	10.88 per cent
Cost of debt	Calculated as the yield on ten year BBB rated bonds calculated over the five year period 1 April 2004 to 1 April 2009 (i.e. 7.45 per cent)
Nominal "vanilla" WACC	8.82 per cent

Source: AER

The AER was of the view that these parameters will:

- contribute to the achievement of the National Electricity Objectives;
- allow service providers to recover efficient costs;
- provide incentives for efficient investment; and
- be appropriate in relation to the economic costs and risks of under and over investment in the sector.

More detail on the evidence examined in establishing the various parameters is set out in Table A1.2.

Table A1.2: AER's approach to setting WACC parameters

Parameter	Evidence examined and approach
Gearing	• Average level of gearing across a number of approaches for calculating the ratio, examining the period 2002-2007. • Bloomberg's "market valuation" approach over the period 2002-2007. • ACG's approach to "market valuation" over the period 2002-2007. • Bloomberg's measure of book gearing. • Standard and Poor's measure of gearing from 2002-2007. • Revenue and pricing principles were considered.
Nominal risk-free rate	• The most appropriate proxy for the risk-free rate was considered to be the CGS yield. • Consistency between the term of the risk-free rate and the market risk premium was considered to be important. • Evidence suggesting a departure from the 10 year term assumption for the risk-free

Parameter	Evidence examined and approach
	rate was not found to be persuasive. • Revenue and pricing principles were considered.
Market risk premium	• Consideration of long-term historical estimates. • Examination of survey measures showing values adopted by market practitioners. • Cash flow based measures were examined.
Equity beta	• Examination of empirical evidence from Australia and foreign data. • The most appropriate period was considered to be after the "technology bubble." • Equity beta estimates using weekly and monthly observations were used. • The AER did not consider that conceptual considerations provided grounds to form a conclusive view on the equity beta of a benchmark efficient network service provider. • Considered that there was no compelling evidence to suggest that equity betas should differ based on the form of the control.
Credit rating	• Examined median credit ratings for energy networks. • Applied the "best comparators" approach. • Regression analysis and simple averages were used.

Source: AER

ANNEX 2: CALIBRATING RETURNS

This annex presents information on the range of returns achieved by companies in utility and other capital intensive industries over the last ten years. This information may provide useful evidence against which to assess the range of returns that network operators should be able to achieve given their risk/return profile.

This annex presents evidence from a sample of European publicly listed companies in a selected group of capital intensive industries. Given the multitude of factors driving each company's returns and the data/statistical challenges for deriving reliable figures, this information should not be interpreted out of context. The evidence in this annex is intended to inform a "bounds approach" with which to provide a context for assessing the range of returns regulated utilities should be earning. The evidence in this annex is based on two metrics:

- return on equity (ROCE); and
- return on capital employed (ROE).

Figure A2.1 below shows the spread of return on capital employed (ROCE) for a number of companies in capital intensive industries.[39]

Figure A2.1: Return on capital employed for a sample of 95 capital intensive companies (2000-2009)

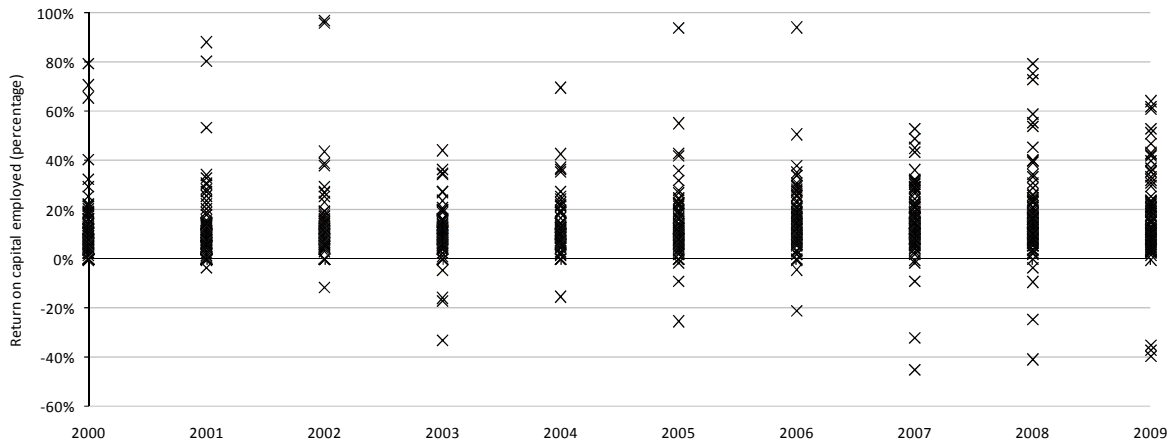


Figure A2.1 shows the individual ROCE observations for the full sample of companies examined. This shows a high frequency of returns within a shifting central range, with a number of extreme positive outliers and a smaller number of negative returns. Given the propensity for the distribution of returns to change over time, it is not clear that this can provide either stable or useful bounds on regulated utility returns. The remainder of this annex focuses on ROCE and ROE for two subsets of our sample: utility and infrastructure companies; and other capital intensive companies. Interpretation of the results is found above in Section 8 of the main report.

[39] The sample is of 95 companies from a range of industries and companies. All companies are publicly listed and the data is adjusted for exceptional items. Companies are listed in the EU and US, and in the early years used different accounting standards before mandatory conversion to IFRS. Note that these figures are likely to be affected by "survivorship bias" and given that this sample is of large publicly listed companies, while this is not the case for all network operators.

Utilities and infrastructure ROCE

Figure A2.2: Distribution of ROCE for a sample of 39 utility and infrastructure companies (2000-2009)

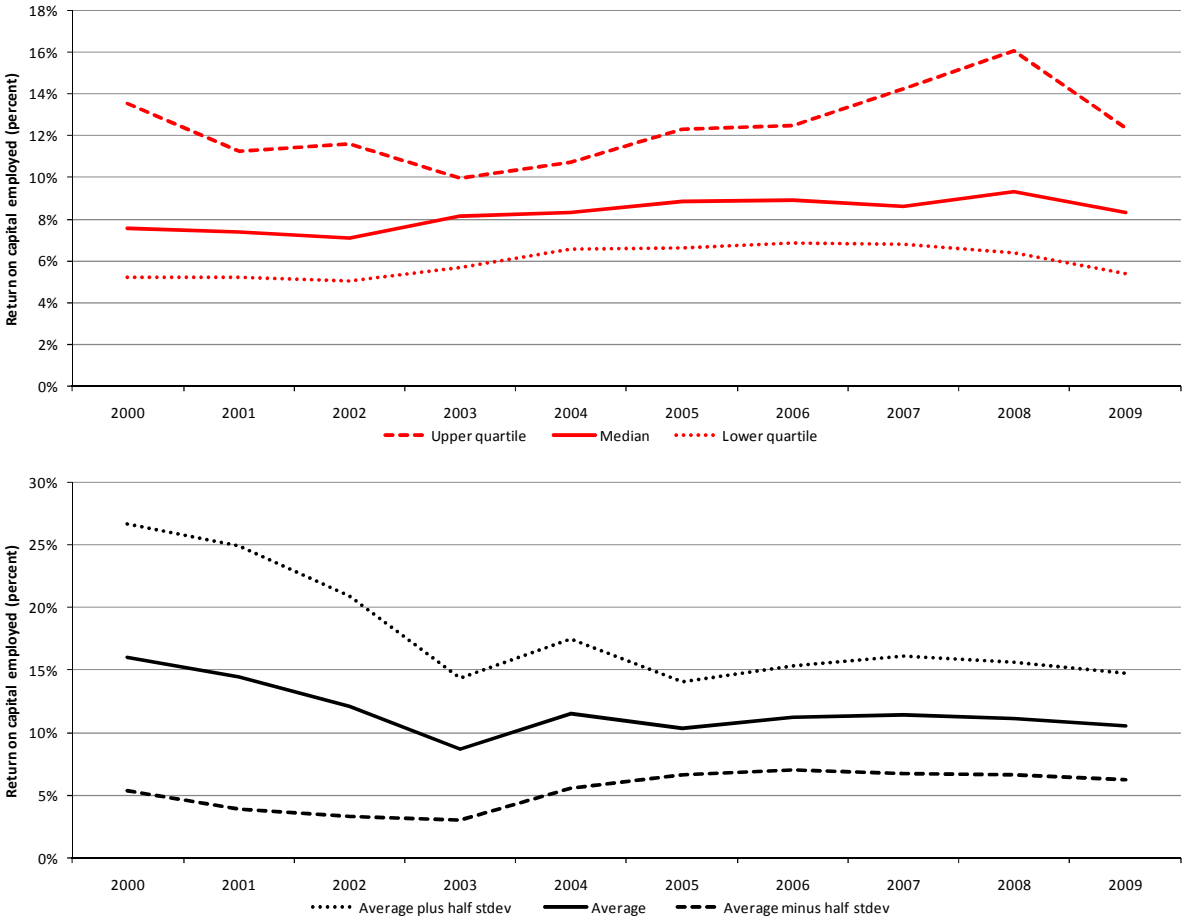


Table A2.1: Summary statistics for ROCE for a sample of 39 utility and infrastructure companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average (%)	16.0	14.4	12.1	8.7	11.5	10.4	11.2	11.4	11.1	10.5
Stdev (%)	21.3	20.9	17.6	11.3	12.0	7.4	8.3	9.4	9.0	8.5
Max (%)	79.5	88.2	95.9	44.2	69.7	35.9	37.8	45.2	40.0	43.2
Upper quartile (%)	13.6	11.3	11.6	9.9	10.7	12.3	12.5	14.3	16.1	12.4
Median (%)	7.5	7.4	7.1	8.2	8.3	8.8	8.9	8.6	9.3	8.3
Lower quartile (%)	5.2	5.2	5.1	5.7	6.6	6.6	6.8	6.8	6.4	5.4
Minimum (%)	1.4	-0.4	-11.6	-33.1	2.2	-9.1	-4.3	-1.5	-9.4	-0.3
Observations	27	29	33	33	35	35	37	38	38	38
Negative observations	0	1	1	1	0	1	1	2	2	1
Pr(ROCE negative)(%)	0.0	3.4	3.0	3.0	0.0	2.9	2.7	5.3	5.3	2.6
Pr(ROCE negative if negative last year) (%)	66.7									
Scaled quintile range (%)	4.2	3.0	3.3	2.1	2.1	2.8	2.8	3.7	4.8	3.5
Half Stdev (%)	10.7	10.5	8.8	5.6	6.0	3.7	4.1	4.7	4.5	4.3

Table A2.2: Frequency of observations by ROCE range for a sample of 39 utility and infrastructure companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Proportion <0 (%)	0.0	3.4	3.0	3.0	0.0	2.9	2.7	5.3	5.3	2.6
Proportion 0-5 (%)	25.9	17.2	21.2	18.2	11.4	5.7	8.1	10.5	15.8	21.1
Proportion 5-10 (%)	44.4	51.7	39.4	54.5	54.3	51.4	43.2	39.5	31.6	36.8
Proportion 10-15 (%)	3.7	10.3	21.2	12.1	22.9	25.7	29.7	23.7	15.8	15.8
Proportion 15-20 (%)	3.7	0.0	3.0	6.1	2.9	8.6	8.1	13.2	21.1	15.8
Proportion 20-30 (%)	7.4	3.4	6.1	0.0	2.9	2.9	2.7	2.6	5.3	2.6
Proportion 30+ (%)	14.8	13.8	6.1	6.1	5.7	2.9	5.4	5.3	5.3	5.3

Utilities and infrastructure ROE

Figure A2.3: Distribution of ROE for a sample of 39 utility and infrastructure companies (2000-2009)

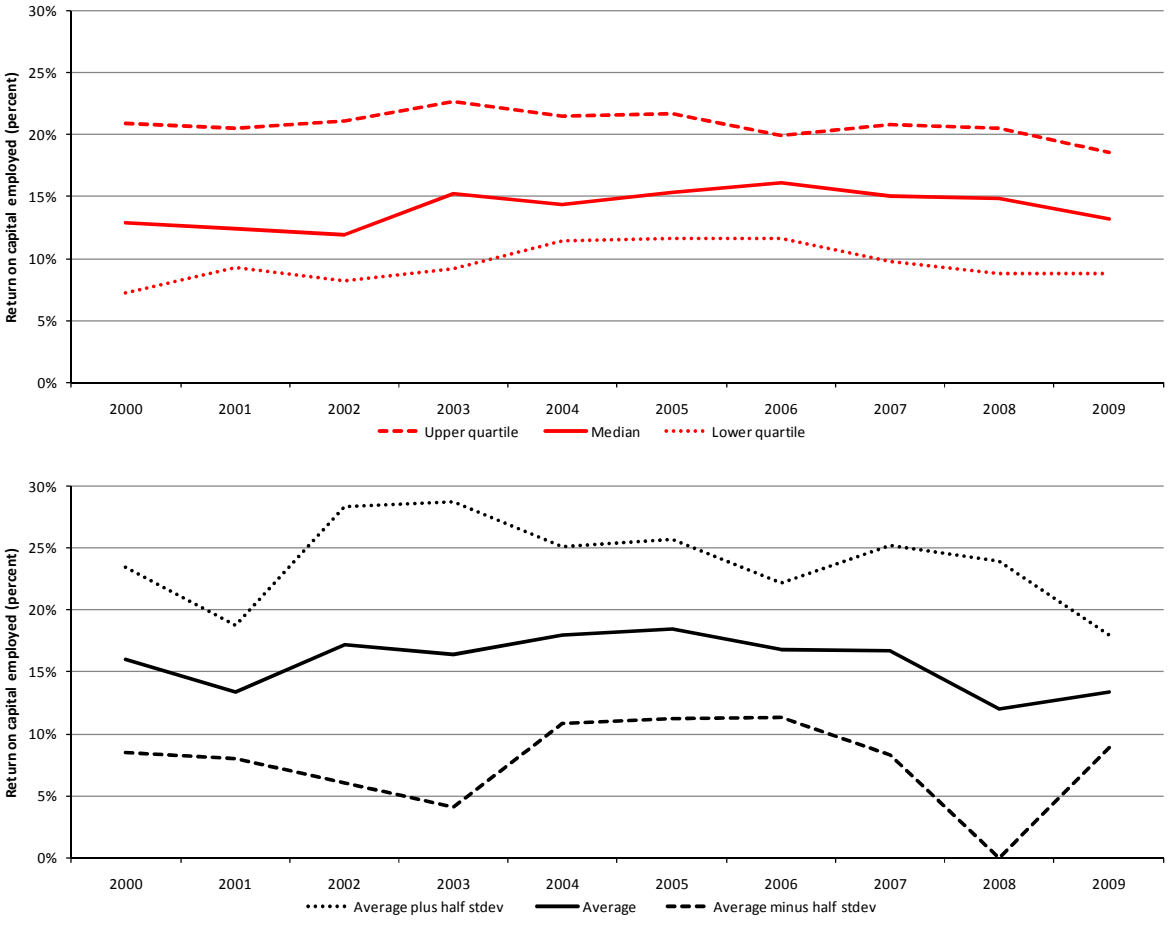


Table A2.3: Summary statistics for ROE for a sample of 39 utility and infrastructure companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average (%)	16.0	13.4	17.2	16.4	17.9	18.5	16.8	16.7	12.0	13.4
Stdev (%)	14.9	10.7	22.3	24.6	14.3	14.4	10.9	16.9	23.9	9.1
Max (%)	77.2	36.9	104.5	95.9	68.5	81.7	57.1	95.9	42.3	33.6
Upper quartile (%)	20.9	20.5	21.1	22.7	21.5	21.7	19.9	20.8	20.5	18.5
Median (%)	12.9	12.4	11.9	15.2	14.3	15.3	16.1	15.0	14.8	13.2
Lower quartile (%)	7.2	9.3	8.2	9.2	11.4	11.6	11.6	9.7	8.8	8.8
Minimum (%)	-3.0	-25.5	-47.4	-83.2	-6.0	0.2	-1.7	-17.4	-120.2	-11.3
Observations	28	31	33	35	36	36	39	39	39	39
Negative observations	2	2	1	1	1	0	2	2	2	2
Pr(ROCE negative)(%)	7.1	6.5	3.0	2.9	2.8	0.0	5.1	5.1	5.1	5.1
Pr(ROCE negative if negative last year) (%)	61.5									
Scaled quintile range (%)	6.8	5.6	6.5	6.8	5.1	5.1	4.1	5.6	5.8	4.9
Half Stdev (%)	7.5	5.4	11.1	12.3	7.1	7.2	5.4	8.4	12.0	4.5

Table A2.4: Frequency of observations by ROE range for a sample of 39 utility and infrastructure companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Proportion <0 (%)	7.1	6.5	3.0	2.9	2.8	0.0	5.1	5.1	5.1	5.1
Proportion 0-5 (%)	3.6	3.2	3.0	8.6	2.8	8.3	5.1	5.1	12.8	12.8
Proportion 5-10 (%)	17.9	22.6	27.3	17.1	13.9	8.3	10.3	15.4	12.8	17.9
Proportion 10-15 (%)	28.6	22.6	24.2	20.0	30.6	30.6	25.6	23.1	20.5	23.1
Proportion 15-20 (%)	10.7	16.1	12.1	17.1	19.4	19.4	28.2	20.5	20.5	23.1
Proportion 20-30 (%)	25.0	25.8	18.2	22.9	19.4	25.0	17.9	23.1	23.1	15.4
Proportion 30+ (%)	7.1	3.2	12.1	11.4	11.1	8.3	7.7	7.7	5.1	2.6

Other capital intensive companies ROCE

Figure A2.4: Distribution of ROCE for a sample of 56 capital intensive companies (2000-2009)

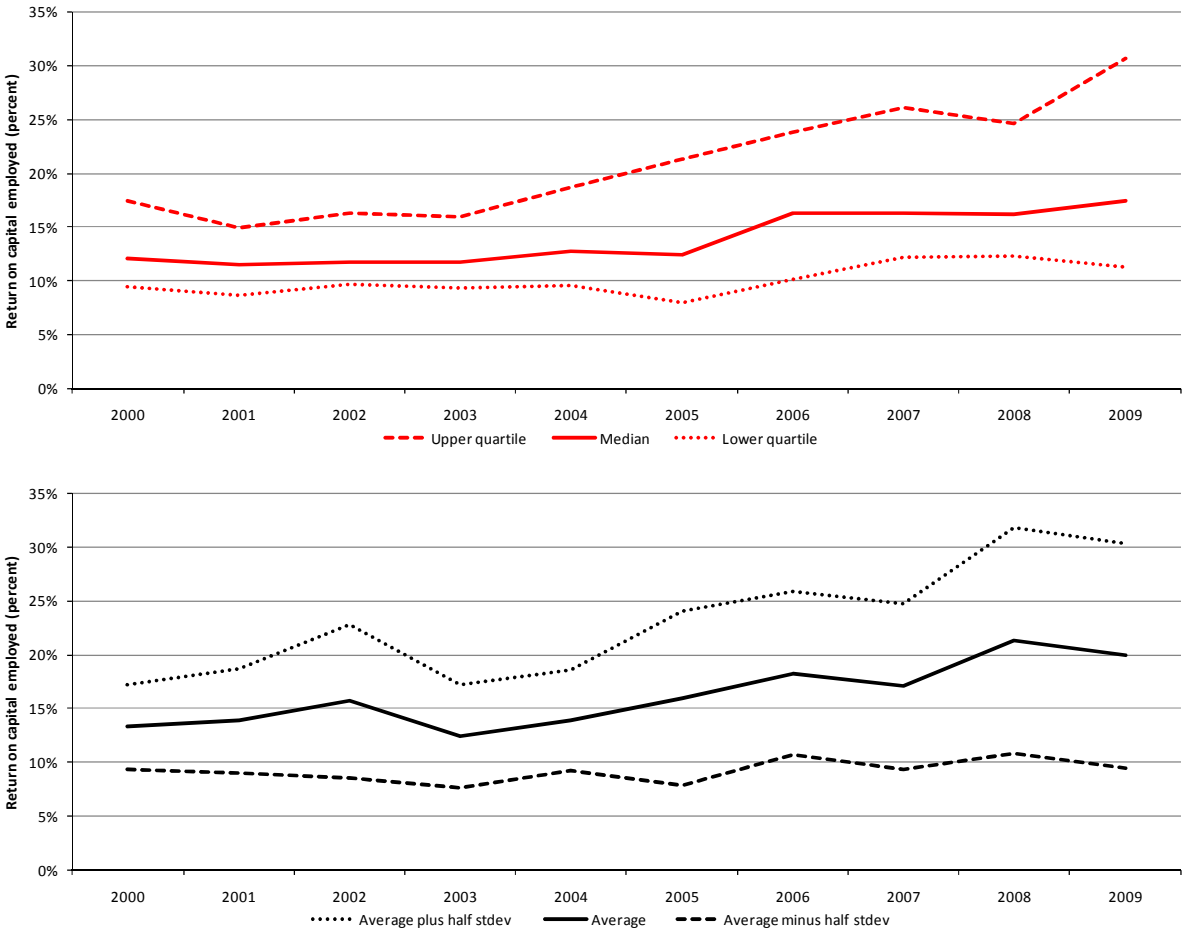


Table A2.5: Summary statistics for ROCE for a sample of 56 capital intensive companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average (%)	13.3	13.9	15.7	12.4	13.9	16.0	18.3	17.1	21.3	19.9
Stdev (%)	7.9	9.7	14.3	9.6	9.2	16.2	15.1	15.4	21.0	20.8
Max (%)	40.5	53.3	97.1	36.5	42.8	94.0	94.2	53.0	79.6	64.2
Upper quartile (%)	17.4	14.9	16.3	15.9	18.7	21.4	23.8	26.1	24.7	30.6
Median (%)	12.0	11.5	11.7	11.7	12.8	12.4	16.3	16.3	16.2	17.5
Lower quartile (%)	9.5	8.7	9.6	9.3	9.6	8.0	10.1	12.2	12.3	11.3
Minimum (%)	-0.7	-3.7	5.0	-16.9	-15.4	-25.3	-21.2	-45.2	-40.8	-39.6
Observations	38	44	46	49	51	53	53	54	54	54
Negative observations	1	1	0	3	1	2	2	3	3	3
Pr(ROCE negative)(%)	2.6	2.3	0.0	6.1	2.0	3.8	3.8	5.6	5.6	5.6
Pr(ROCE negative if negative last year) (%)	43.9									
Scaled quintile range (%)	4.0	3.1	3.3	3.3	4.6	6.7	6.8	7.0	6.2	9.7
Half Stdev (%)	3.9	4.9	7.1	4.8	4.6	8.1	7.6	7.7	10.5	10.4

Table A2.6: Frequency of observations by ROCE range for a sample of 56 capital intensive companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Proportion <0 (%)	2.6	2.3	0.0	6.1	2.0	3.8	3.8	5.6	5.6	5.6
Proportion 0-5 (%)	7.9	4.5	0.0	8.2	5.9	9.4	3.8	1.9	0.0	7.4
Proportion 5-10 (%)	15.8	29.5	28.3	16.3	25.5	18.9	15.1	7.4	11.1	5.6
Proportion 10-15 (%)	42.1	38.6	41.3	32.7	37.3	30.2	22.6	31.5	24.1	20.4
Proportion 15-20 (%)	18.4	6.8	17.4	24.5	11.8	11.3	18.9	14.8	22.2	16.7
Proportion 20-30 (%)	10.5	11.4	6.5	8.2	11.8	17.0	26.4	24.1	16.7	18.5
Proportion 30+ (%)	2.6	6.8	6.5	4.1	5.9	9.4	9.4	14.8	20.4	25.9

Other capital intensive companies ROE

Figure A2.5: Distribution of ROE for a sample of 56 capital intensive companies (2000-2009)

Table A2.7: Summary statistics for ROE for a sample of 56 capital intensive companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average (%)	13.3	13.9	18.5	14.7	11.6	-0.6	17.0	18.1	19.0	19.7
Stdev (%)	12.7	12.1	10.9	11.8	25.4	121.6	13.2	10.4	10.0	11.5
Max (%)	47.8	50.4	50.7	64.7	46.1	80.4	45.0	40.8	44.4	50.9
Upper quartile (%)	19.1	17.3	21.9	20.3	22.5	19.9	24.8	24.1	24.2	27.2
Median (%)	13.7	13.7	14.9	13.5	12.7	15.0	15.7	17.9	17.1	17.6
Lower quartile (%)	5.6	7.6	11.4	7.6	7.8	8.1	10.8	12.1	11.6	12.6
Minimum (%)	-16.2	-26.7	5.3	-13.7	-151.4	-872.9	-44.9	-20.0	-1.5	0.3
Observations	39	45	48	51	54	54	55	56	56	56
Negative observations	4	4	0	3	3	3	2	2	1	0
Pr(ROCE negative)(%)	10.3	8.9	0.0	5.9	5.6	5.6	3.6	3.6	1.8	0.0
Pr(ROCE negative if negative last year) (%)	31.8									
Scaled quintile range (%)	6.8	4.9	5.2	6.4	7.4	5.9	7.0	6.0	6.3	7.3
Half Stdev (%)	6.3	6.0	5.5	5.9	12.7	60.8	6.6	5.2	5.0	5.7

Table A2.8: Frequency of observations by ROE range for a sample of 56 capital intensive companies (2000-2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Proportion <0 (%)	10.3	8.9	0.0	5.9	5.6	5.6	3.6	3.6	1.8	0.0
Proportion 0-5 (%)	12.8	6.7	0.0	2.0	7.4	5.6	3.6	0.0	5.4	5.4
Proportion 5-10 (%)	7.7	11.1	8.3	27.5	27.8	20.4	7.3	16.1	10.7	14.3
Proportion 10-15 (%)	25.6	33.3	43.8	23.5	22.2	16.7	34.5	19.6	17.9	19.6
Proportion 15-20 (%)	20.5	20.0	16.7	11.8	9.3	27.8	12.7	19.6	23.2	21.4
Proportion 20-30 (%)	17.9	11.1	18.8	21.6	22.2	18.5	23.6	30.4	30.4	25.0
Proportion 30+ (%)	5.1	8.9	12.5	7.8	5.6	5.6	14.5	10.7	10.7	14.3

ANNEX 3: MODELLING SCENARIOS

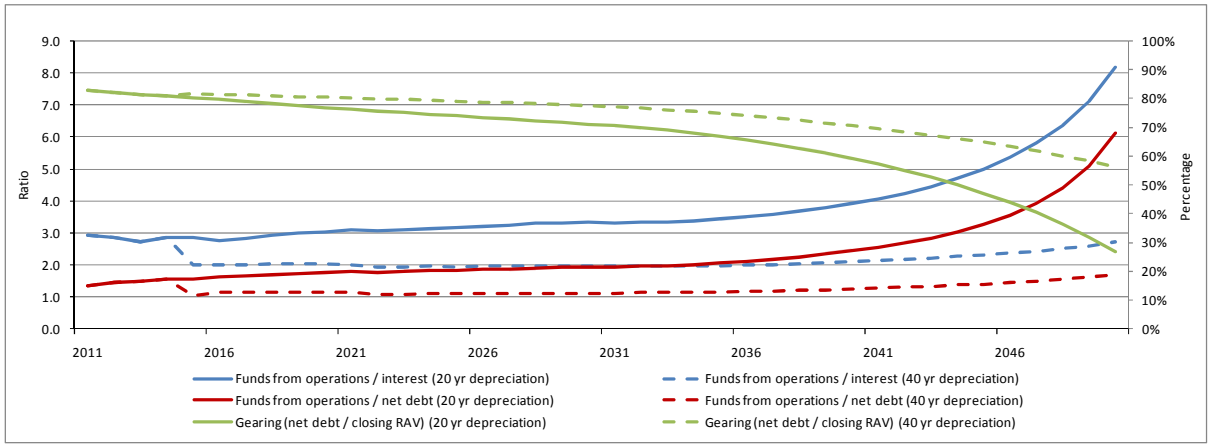
This annex provides a number of modelling outputs for each of the four anonymised companies studied as well as a stylised DNO based on the aggregate industry data provided at EDPCR5:

- Figures showing the impact of changing the depreciation policy from 20 to 40 year asset lives on three financial ratios:
    - funds from operations over interest;
    - funds from operations over net debt; and
    - net debt over closing RAV.
- Table A3.1 provides modelling results of illustrative equity injections required under varying dividend assumptions and financial performance requirements. This table presents the same results as Table 11.2 but as totals for the whole period.

Further details on the modelling exercise are provided in Section 11 of the main report.

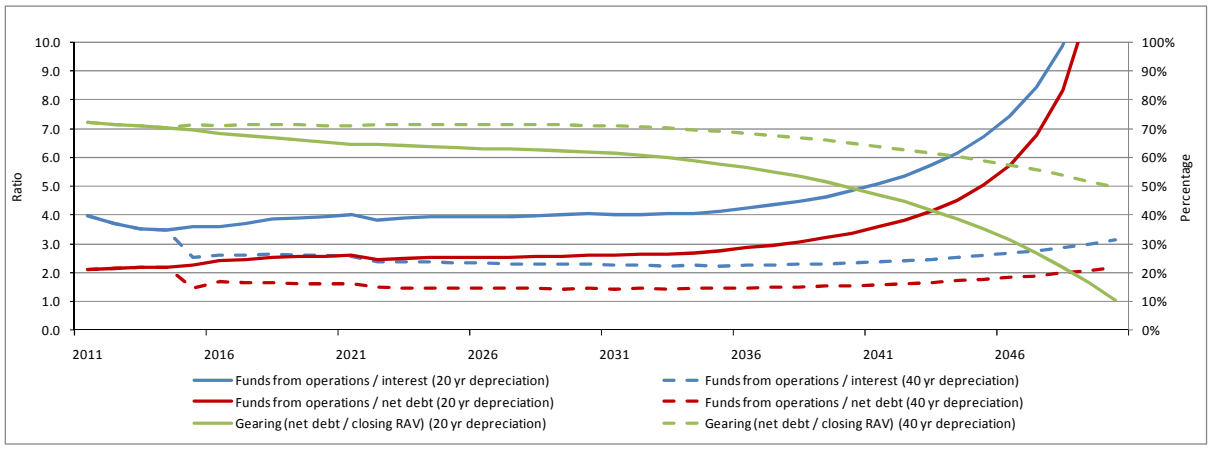
Company 1

Figure A3.1: Company 1 assessment of ratios with 20 and 40 year depreciation – "hump" profile



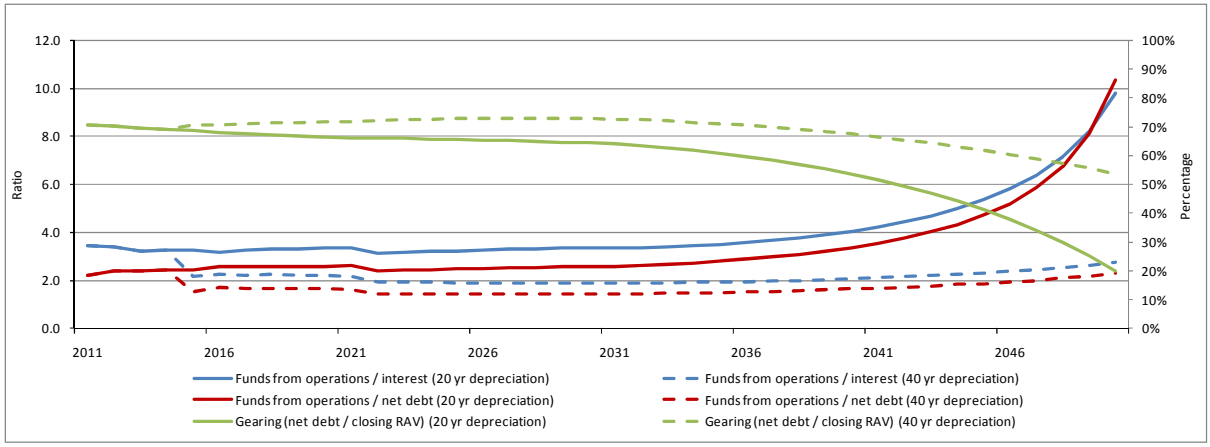
Company 2

Figure A3.2: Company 2 assessment of ratios with 20 and 40 year depreciation – "hump" profile



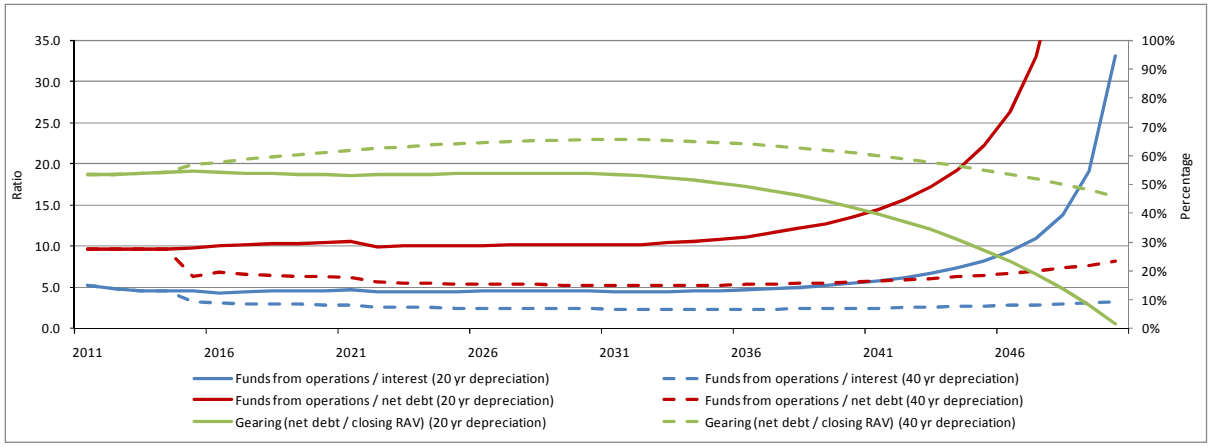
Company 3

Figure A3.3: Company 3 assessment of ratios with 20 and 40 year depreciation – "hump" profile



Company 4

Figure A3.4: Company 4 assessment of ratios with 20 and 40 year depreciation – "hump" profile



Aggregate DNO data

Table A3.5: Aggregated DNO data assessment of ratios with 20 and 40 year depreciation – "hump" profile

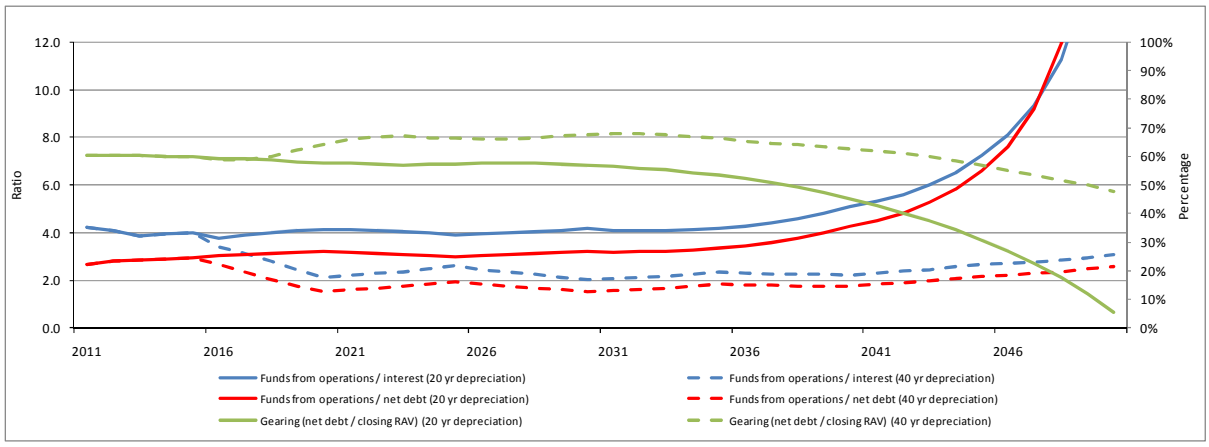


Table A3.1: Total five yearly equity injections required to maintain specified PMICR ratios (2015-2045)

Annual dividend assumption	Financial ratio lower bound	Total five-yearly injections (2015-2045) expressed as a percentage of 2010 closing RAV		
	PMICR	Expenditure scenario[40]		
		"flat"	"hump"	"mountain"
Company 1				
5% equity RAV	1.6 times	50%	75%	135%
None after 2011	1.6 times	25%	25%	25%
5% equity RAV	1.3 times	10%	20%	15%
None after 2011	1.3 times	5%	5%	5%
Company 2				
5% equity RAV	1.6 times	10%	30%	55%
None after 2011	1.6 times	0%	0%	0%
5% equity RAV	1.3 times	0%	0%	0%
None after 2011	1.3 times	0%	0%	0%
Company 3				
5% equity RAV	1.6 times	50%	75%	160%
None after 2011	1.6 times	20%	20%	20%
5% equity RAV	1.3 times	15%	30%	65%
None after 2011	1.3 times	10%	10%	10%
Company 4				
5% equity RAV	1.6 times	0%	25%	70%
None after 2011	1.6 times	0%	0%	0%
5% equity RAV	1.3 times	0%	0%	0%
None after 2011	1.3 times	0%	0%	0%
Aggregated DNO data				
5% equity RAV	1.6 times	20%	40%	100%
None after 2011	1.6 times	0%	0%	0%
5% equity RAV	1.3 times	0%	0%	0%
None after 2011	1.3 times	0%	0%	0%

[40] Expenditure scenarios correspond to three artificial profiles projected from 2016 to 2050 based on the preceding five year average:

- "Flat" – expenditure remains flat for the whole period;
- "Hump" – peak in 2030 at 140 percent, before falling to 40 percent of current levels in 2050; and
- "Mountain" – expenditure grows constantly to reach 220 percent of current levels in 2040.