OFGEM

THE USE OF RPI-X BY OTHER NETWORK INDUSTRY REGULATORS

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FINAL REPORT

Submitted by:

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CEPA

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IMPORTANT NOTICE

EXECUTIVE SUMMARY

Cambridge Economic Policy Associates (CEPA) were commissioned by Ofgem to undertake a "stock-take" (identification, characterisation and review) of regulatory regimes that use the "RPI-X" incentive based framework of regulation – interpreted widely for these purposes. This should help Ofgem consider what lessons could be learned for regulation of the UK energy sector and to identify particular issues that may merit further consideration as part of its RPI-X@20 review. We have reviewed most of the main regulatory regimes in the UK and a selection of overseas regimes, including ones used in the US, Australia, Ireland, the Netherlands and France. This summary focuses on three key parts of our study:

- What are the key differences and similarities between the regimes considered?
- What has worked well and not so well in the regimes considered?
- Options for developing the overarching regulatory framework.

What are the key differences and similarities between the regimes considered?

Our review of the different regulatory regimes in the UK has identified a substantial degree of alignment in the approaches adopted by regulators. This is shown through a number of key features of incentive based regulation in the UK, including:

- Most price controls are set for a period of five years. The only exceptions to this are sectors where the regulated company is subject to some competitive pressures, e.g. post, or a very different form of private involvement is taking place, e.g. the London Underground.[1]
- The approach to setting operating expenditure allowances and providing incentives to minimise these costs tends to be similar across regulators. Most regulators seek to establish a "base year" of costs employing the most recent year of audited cost information and roll this forward using an assessment of the future potential for efficiency savings. Regulated companies generally retain any underspend on opex, but bear the costs of any overspend within the price control period.
- Most UK regulators use some forms of pass through and/or re-opening mechanisms to address risk and uncertainty. A number of costs, including business rates, commonly form part of a pass-through. There are differences in the detailed approaches to re-openers with for example, Ofwat having a detailed list of items for

[1] Occasionally network price controls are set for longer or shorter periods than five years, but this tends to be for administrative convenience. For example, CAA extended the price cap for Stansted airport by an extra year to allow time for the Department for Transport to consider whether the airport should be de-designated for the purposes of setting a price cap.

which companies can apply for a re-opener as well as a general "shipwreck" clause, while Postcomm just uses the more general "shipwreck" clause.

- The approach to setting the cost of capital tends to be very similar and based primarily on the a weighted average cost of capital (WACC) with equity costs estimated through the Capital Asset Pricing Model (CAPM), with some supplementary considerations. UK regulators have also taken a broadly similar approach to assessing whether price control settlements are financeable, based on considering whether the companies would be able to achieve comfortable investment grade credit ratings on the basis of the ratios used by credit rating agencies to make such assessments.

The degree of alignment in the approaches of UK regulators is not surprising given all their price control decisions are subject to potential appeal to the same body – the Competition Commission. Even though the number of appeals has been low, especially since 2000, the Competition Commission's automatic involvement in the airport price determination process plus other related cases (such as telecoms) provides an indication to regulators of likely decisions on issues such as the cost of capital. Also there have been various efforts to promote alignment between the approaches of the different UK regulators, especially on technical issues such as the Smithers report about cost of capital.[2] Furthermore, regulators have tended to cross-refer to each other's decisions when developing methodologies at price control reviews.

The differences between the approaches adopted by Ofgem and other UK regulators tends to focus on incentives for capital expenditure and the role of consumers in helping set price controls. Ofwat and Ofgem have tried to develop better incentives for efficient capital expenditure, including the use of rolling incentives and the introduction of menu regulation. In part this reflects the importance of capital expenditure to the regulatory settlement in these sectors, which has only increased in recent years.

The introduction of menu regulation reflects that even after 20 years of regulation, both these sectors consider that significant issues remain to ensure effective incentives for efficient capital expenditure. The CAA for Heathrow airport's Terminal 5 project also used quite an innovative approach based on triggers linked to key milestones in the project. In contrast, other regulators for whom capital expenditure is less important have tended to rely on a simpler form of RPI-X incentives, e.g. post. When setting capital expenditure requirements Ofgem and the CAA have made greater use of direct evidence about customer demand for specific investments than other regulators. For expansions of gas entry capacity, Ofgem has introduced long term auctions to reveal shippers' demand for additional capacity. For the recent price control reviews of Heathrow and Gatwick airport, the CAA used a

[2] Smithers & Co (2006) "Report on the Cost of Capital: provided to Ofgem", accessed at http://www.ofgem.gov.uk/Networks/Trans/PriceControls/TPCR4/ConsultantsReports/Documents1/15576-smithers_co.pdf

process of Constructive Engagement to encourage dialogue between the airport owner (BAA) and the airlines regarding future expenditure requirements. Ofwat has tended to rely on less direct evidence in the form of cost benefit analysis provided by the regulated companies – although this does incorporate willingness-to-pay evidence from consumers. Other regulators tend to rely on engineering assessments of the need for capital expenditure.

While there are greater differences between the approaches employed by Ofgem and regulators in other countries, there is also evidence that regulators in other countries have to some degree adopted and adapted the RPI-X/ incentive based regulatory framework developed in the UK. For example, the French and Irish gas sectors have simplified forms of RPI-X regulation. The US has a greater variety of approaches to incentive based regulation, including notably the use of price caps with control periods greater than five years, but there remain many similarities with approaches adopted in the UK. As each state in the US has regulatory responsibilities together with federal organisations, there are a wide variety of regulatory approaches used, including continued reliance on rate of return regulation, which has limited incentives for efficiency savings. As we discuss further below, perhaps one of the most interesting aspects of comparisons with other countries is to consider whether the generally more complex incentive based regimes in the UK have delivered commensurate benefits compared to simpler regimes in other countries.

Table S1 summarises the key similarities and differences between the regulatory regimes that we have considered.

Table S1: A summary of the key similarities and differences between the regulatory regimes considered in this study

Key similarities	**Key differences**
• Length of price controls (generally five years) • Approach to setting operating expenditure and cost minimisation incentives • Quality of service targets with financial incentives • Approach to setting the cost of capital (reliance on CAPM) • Broad approach to rolling forward the Regulated Asset Base (RAB) • Use of straight line depreciation • Use of pass-through and re-opening mechanisms to address risk and uncertainty • Approach to assessing whether a proposed price control assessment is financeable	• Approach to estimating the required capital expenditure (use of cost benefit analysis, engineering assessment or evidence of customer demand, level of detail of the assessments) • Incentives for efficient capital expenditure (rolling incentives or menu regulation compared to simple RPI-X) • The use of output measures to assess the effectiveness of expenditure • The nature of the detailed pass through and re-opening mechanisms that are used (specific items versus a shipwreck clause, role of drivers, automatic adjustments) • Treatment of tax (some regulators use statutory rates while others seek to calculate the actual tax paid)

• Arrangements for monitoring actual company performance compared to the price control settlement, including the use of regulatory accounts	• Degree of simplicity (particularly between UK and non-UK regulators) • Role for tendering/ contracting out

It is also important to bear in mind when considering which options have been tried in different regulated sectors that the culture of the regulators (including the commissioners/ staff) and the regulated companies affect the approaches adopted. All regulator and company relations will be characterised by a degree of tension, but a very poor relationship can make effective regulation extremely difficult, while on the other hand an excessively close relationship can raise concerns of regulatory capture. Perhaps the most effective regulation occurs where there is a healthy tension, but accompanied by mutual respect. Furthermore, the statutory framework, degree of independence of the regulator, role of Government (perhaps as an appeal body), the political and cultural environment of a sector, the historical approach to regulation, and the industry structure in terms of ownership and vertical/ horizontal separation will all affect how it is applied. This is particularly important to bear in mind when comparing approaches in different countries. While countries such as Australia tend have a similar approach to ensuring the independence of regulators to the UK, in continental Europe there can often be a greater role for the Government to oversee regulators' decisions.[3]

Some of the differences between the regulatory approaches may provide areas for Ofgem to consider further as part of the RPI-X@20 review. Some of these areas may be particularly relevant given the challenges that Ofgem will face when regulating the UK energy sector in the future. Although there are differences in the use of output measures across regulators, we have not identified this as a particular area for further consideration because in our view there are not particularly good examples from other regimes that Ofgem could consider. It is more likely in addressing this issue that Ofgem would need to develop approaches primarily from first principles. The three options we have considered are:

- Customer involvement and the use of constructive engagement.
- Price caps set for more than five years.
- Dealing with capex uncertainty.

Customer involvement and the use of constructive engagement

Customer engagement can occur in two ways (not mutually exclusive), namely:

[3] See for example: New regulatory institutions for markets – Independent Regulatory Agencies in Europe, M. Thatcher, presentation to OECD expert meeting – Designing Independent and Accountable Regulatory Authorities for High Quality Regulation, 2005.

- *ex ante* involvement in the price determination process; and
- *ex post* involvement through the right to appeal.

As noted above, Ofgem has been relatively innovative in efforts to involve the direct customers of the regulated transmission businesses in *ex ante* investment decisions, since they are increasingly moving to a position where only investment backed by a clear customer demand and financial commitment is included in the price control (these approaches are now a key feature for gas entry and exit capacity).[4] Although it is notable that with the challenges of extensive investment on the electricity transmission network, and given the nature of the Government's renewables target, Ofgem is encouraging transmission companies to consider building some assets ahead of a clear user commitment to use and pay for the assets.

The CAA has used a variant of this approach, called constructive engagement, during the recent price control reviews of Heathrow and Gatwick airports. An assessment of the success of these approaches will depend on your view of the criteria and counter-factual against which to compare outcomes. However, there is some evidence of better engagement between the airports and airlines, albeit the Competition Commission in its Provisional Findings and Provisional Decision on Remedies for its Market Investigation of BAA's airports has identified areas for improving constructive engagement.[5] The approach largely broke down for Stansted airport, where the views of the airport and airlines appeared too far apart to be closed through discussion. This approach is also an example where there are large intermediaries as the direct customers of the regulated entity, i.e. the airlines.

From reviewing other sectors the much greater challenge is how to better involve consumers in decision making where the direct customers of regulated companies are not large well informed intermediaries. The water sector is perhaps the best example of this where the Consumer Council for Water (CC Water) has a relatively important role in the price control process and extensive surveys of consumer willingness to pay for certain improvements and projects are carried out and carefully assessed. To date, other regulators have generally utilised consultation and surveys of consumer attitudes but struggled to identify anything particularly innovative beyond these approaches.

Ex post involvement has been more limited although examples exist in telecoms and energy, with the latter focused around code modifications rather than price determinations. However, there are discussions under way on the possible appeals role for airlines in a reformed airport regulatory framework. Also, examples from overseas, especially Ireland,

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[4] A number of the proposals being considered in the current Transmission Access Review reflect a similar desire to link investment decisions and priorities more closely to evidence of customer requirements.

[5] Competition Commission (2008) "BAA Airports: Provisional Findings Report" accessed at http://www.competition-commission.org.uk/inquiries/ref2007/airports/provisional_findings.htm and Competition Commission (2008) "BAA Airports: Provisional Decision on Remedies", accessed at http://www.competition-commission.org.uk/inquiries/ref2007/airports/provisional_decision_remedies.htm

exist of customer related appeal mechanisms, e.g. Ryanair's recent appeal of the Commission for Aviation Regulation's interim price determination for Dublin Airport.

Price caps set for more than five years

It can be argued in capital intensive regulated sectors that a longer term period for a price control can increase the incentives for achieving efficiency savings, not least because there is greater scope to plan investment over the longer term. Indeed although the rolling capital expenditure incentives used by Ofgem and Ofwat do not formally extend price control periods they are designed to help encourage more consistent long term planning. It can also be argued, although it is more debatable and dependent on the nature of measures to deal with uncertainty, that long term price controls are potentially a way of reducing the cost of capital (it is extremely difficult to test cause and effect empirically). A longer term approach appears to have been tried relatively successfully in the US (it was accompanied by re-openers), and was considered, but rejected, by Ofwat in the early stages of its current price control review.[6] While Ofwat recognised the benefits of longer term planning it was not convinced that the information on which it would have to base a longer term price control would be sufficiently robust.[7]

The main difficulty that this approach raises is how to deal with the inevitably greater uncertainty and to some degree risk for opex and capex over the 10 year period. As the examples from the US indicate, a longer price control period would probably need to be accompanied by a greater use of re-openers, triggers and logging-up.

As we appear to be moving into a high investment period in the UK energy sector there may be particular merit in exploring options to set longer price controls than five years given that the absolute value of efficiency savings and any reduction in the cost of capital (if there was one) increases with the size of the capex programme. Alternatively, there may be options that involve splitting the price determination into different elements and considering each of these at different times, say efficiency reviews every five years, capex incentives for greater than five years and new capex reviews every three years (or as needed). While no direct example of this approach exists it could be considered a development of the London Underground Office of the PPP Arbiter (OPPPA) approach which focuses only on incremental capex and opex at each review, with the reviews every seven and a half years.

Dealing with capex uncertainty

This is an area where regulators in the UK have tried various options, which have worked relatively well on a number of occasions. Ofwat has used interim determinations (IDOKs)

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[6] It was, of course, embodied in the original water framework where the controls were to be set for 10 years with the option of reviewing the situation after five.

[7] "A sustainable water industry – To PR09 and beyond", Ofwat, October 2006.

and logging-up over a number of price control periods, which means that the process is relatively well understood, which should reduce the likelihood that companies submit IDOKs that lack merit. Companies also appear to have confidence in how Ofwat will treat logged-up costs. The CAA's triggers for the capex associated with Heathrow airport's Terminal 5 were also regarded as a relatively successful means to deal with capex uncertainty (at least better than the initial asymmetric IDOK that had been adopted) and new triggers were utilised in the latest determination. Although concerns have been raised by many market participants, the use of auctions and revenue drivers for capex related to gas transmission entry capacity has led to a relatively unconstrained network and timely expansion of capacity. This can be contrasted with a very congested electricity transmission network in parts and a large queue of generators seeking to connect, but unable to do so due to a lack of capacity.

The challenge for Ofgem going forward is to build on what it already does in this area, and incorporate the best of what has been used elsewhere. As compared to some other sectors Ofgem also has the challenge of considering the impact of re-openers and other measures to address uncertainty on the volatility of charges faced by suppliers operating in competitive markets.

What has worked well in the regimes considered?

Given the nature of the "stock-taking" study we have been asked to carry out by Ofgem, we have not carried out a detailed review of how well different approaches have worked in different sectors and countries, and in particular, we have not carried out any empirical work in this regard. However, while undertaking the study we have identified particular views and evidence that provides indications about what has worked well and what has not. A potentially important indication of the effectiveness of different approaches is whether they are retained over time by regulators and whether they are adopted by other regulators.

Furthermore, as with any assessment, a key element of assessing the relative success of different regulatory regimes is about agreeing the appropriate criteria against which to make the assessment. As we discuss below, arguably the appropriate criteria for assessing the success of the RPI-X and incentive based regimes are changing.

If we consider the overall RPI-X model as applied in the UK, there is much evidence to suggest that the incentive based framework for utility regulation has to date worked quite effectively in meeting many of the objectives for utility regulation. In particular, most sectors that have applied the framework for operating expenditure have seen substantial efficiency savings compared to the period before independent regulation (and often privatisation). There have also been substantial levels of capital expenditure, particularly compared to when the same companies were operated in the public sector. Evidence also suggests that the quality of service received by customers, including network reliability, has been high and improving. All these factors were identified by the NAO in its Pipes and Wires report that largely endorsed the RPI-X framework, albeit a number of years ago, and

before a number of the key challenges facing the energy sector, particularly to meet environmental challenges, had become apparent.[8] Although there has not been a similarly comprehensive independent review of the performance of the general RPI-X framework in the UK since the NAO report, there have been a range of indications that its performance remains generally good.[9]

Nevertheless, there are outcomes that a relatively simple incentive based regulatory framework may not adequately deliver. In relatively capex intensive sectors like energy, aviation and water, there are concerns (particularly in the UK) about whether the RPI-X framework promotes the right type of investment at the right time. There are also concerns about whether there are risks of difficult to identify longer term deteriorations in quality (perhaps resulting from poor asset maintenance) as a result of the incentives to make efficiency savings.

The concerns about the effectiveness of this aspect of incentive based regulation has been reflected in a range of initiatives tried by a number of regulators including rolling capital expenditure incentives (Ofwat and Ofgem), menu regulation (Ofwat and Ofgem) constructive engagement (CAA), long term auctions (Ofgem), use of triggers and revenue drivers (CAA, CER (Ireland)) and cost of capital uplifts (CRE (France)). Some of these appear to have been relatively successful, e.g. rolling incentives and triggers have been adopted by a range of different regulators, while for others it is too early to say, e.g. menu regulation.

In most cases these changes have been introduced in response to specific concerns that the existing framework for regulation in a sector is not working well and/or in response to changing external circumstances. Ofgem introduced long term auctions for gas entry capacity after customers incurred significant costs from constraints in the availability of entry capacity, which suggested that appropriate signals and incentives for investment in capacity were not in place. The cost of capital uplifts used by CRE in France for investments that reduce constraints and promote the potential to reduce the number of balancing zones are a response to the constraints on wholesale and retail competition in France because of the lack of transmission capacity, particularly between the North and South of the country.

The nature of the challenges facing utility companies and regulators are changing, most notably with the need to respond to the Government's environmental policies and in particular its policies to address climate change. We can already see regulators responding to these changing priorities, such as Ofwat's introduction of two part cost benefit analysis for new investments, which allows consideration of the social and environmental impacts of

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[8] National Audit Office (2002) "Pipes and Wires", accessed at http://www.nao.org.uk/publications/0102/pipes_and_wires.aspx

[9] This includes the continued endorsement of the use of RPI-X regulation for Heathrow, Gatwick and Stansted airports by the Competition Commission in the last two years, and continuing evidence across a range of sectors of efficiency savings and strong levels of investment.

investments. These changes are likely to affect the criteria that policy-makers, in particular, use to assess whether incentive based regulation is working effectively. The then Secretary of State for Transport identified addressing the environmental impact of aviation as one of her three policy objectives for the review of the regulatory framework for UK airports. It may also affect the focus of attempts to improve or develop the RPI-X framework. For example, significant focus in recent years has been on providing better signals of consumer demand as a driver for specific investment projects. Where investment projects are linked more to Government policy objectives it will be harder to make approaches based on evidence of consumer demand work effectively.

Developing the overarching framework

When reviewing approaches to incentive based regulation in other sectors and countries for this study we have focused to a significant degree on the detailed elements of the regime, and what options and approaches used in other regimes might provide useful lessons for Ofgem to consider. However, the review also highlights that in some other regimes there are more overarching differences in the approaches adopted to incentive based regulation, including:

- returning to a relatively simple RPI-X framework; and
- placing a greater emphasis on contracting out for new investment.

CEPA organised a workshop for Ofgem in January 2009 that discussed four strawmen that considered options for developing the overarching regulatory framework. A note of the discussions at that workshop will be published shortly on Ofgem's website.

A relatively simple framework

At its heart, and when it was originally set out by Stephen Littlechild, RPI-X or incentive based regulation was a relatively simple concept. The regulator would set an allowance for a number of years into the future, and the company would have an incentive to out-perform the allowance as it retained those benefits until the price control was reset. Customers benefited from the efficiencies that were achieved because they could be factored into the setting of the new price control. As discussed above, over time the framework has become more complicated, generally in response to some of the perceived shortcomings of the simple framework, including poor quality of service incentives, limited incentives for appropriate and timely capex, and reduced incentives to make efficiency savings towards the end of a price control period. The additional complexity has not been confined to one regulator or sector, and complexity has increased both for the process to set price controls and the detailed licence conditions that implement the controls. The water industry is a good example of a sector with a very intensive and arguably complex process for setting price controls, while the energy sector has relatively complex licence conditions, especially for the transmission price controls.

It is notable that while the framework has become more complicated particularly in the energy and water sectors in the UK, and to some degree the rail sector, other sectors in the UK have retained relatively simple frameworks, including airports, and many of the frameworks used in other countries are quite simple in nature. Although the process for setting price controls for UK airports is relatively complex, the actual price controls are very simple, with a price per passenger for each year and a quality of service rebate scheme. It is notable that the airport's price control in the UK has remained relatively simple despite having been in place for about the same period of time as gas transmission price controls, and while having a similar set of large intermediate customers who are part of the regulatory process. When we discuss relatively simple price controls in other countries, we generally mean a control based on a basic RPI-X framework with a small number of pass-through items, perhaps some quality of service incentives and a one-off process at each review to roll forward the RAB. The Irish and French gas sectors can be broadly described in this way.

While each refinement or addition to the RPI-X framework in the energy and water sectors could potentially be justified on a case by case basis, it is interesting to consider whether the cumulative additional complexity has led to benefits that outweigh the costs created, including through unintended consequences and additional compliance costs. We are not suggesting that the outcomes under simple RPI-X frameworks have always been very good, and we note for example that concerns have been raised in the current Competition Commission Market Investigation of BAA airports about the CAA's approach to regulation, including that it is too light touch. However, concerns have also been raised about some of the outcomes in the more complicated regimes, including for example the evidence of Ofwat being misled by some companies despite the large amount of monitoring activity that is undertaken. There is also a question about how to measure the relative success of regimes, which we acknowledge is not easy, and would probably be most effectively done if robust output measures could be developed.

As a minimum, we consider that it is important as part of the RPI-X@20 project for Ofgem to consider carefully whether any additional complexity over and above a relatively simple framework, such as applies in the French and Irish gas sectors, can be expected to deliver benefits that exceed costs, and to review this position periodically. Examples of relatively simple regimes in the UK and in other countries can provide helpful counterfactuals for such an assessment.

Greater use of contracting out

Probably the biggest challenge for Ofgem in the future relates to the need for and timing of new investment. This is also arguably where RPI-X regulation has the greatest difficulty responding to the challenge because within a relatively simple framework companies have a lot of discretion about the precise nature and timing of new investment. Therefore, it may be appropriate to consider whether RPI-X regulation in its traditional form should be used for operating expenditure, the existing asset base and perhaps maintenance capex (a core

price control), but different approaches could be used for new investment to enhance/ expand capacity or improve outputs. These approaches might include tenders or contracting out of new capex requirements with a view to ensuring that they better meet customer needs. It is important to note that many regulated companies already voluntarily contract out large parts of their capex programmes because they judge it to be the best way to operate with the price control settlement. However, such contracting out is rarely used as a means to identify or check the need for particular investment projects.

Options along these lines have been considered in a number of sectors and countries. For example easyJet and Frontier Economics have developed a proposal for Terminal Tendering in the UK airports sector, which would involve competitive tenders for new terminals rather than an assumption that BAA as the owner of the regulated airports would own, build and operate any new terminal. This approach was also intended to help check the need for a new terminal as the new owner would have no guarantee of achieving the revenue necessary to make the investment profitable so if there were no bidders it would be a signal that the terminal was not required at that time or on that scale. The Competition Commission has expressed some support for this approach in its provisional remedies for its market investigation into BAA's airports.

The new terminal at Dublin Airport has been put out to competitive tender for its operation, although this was not used to determine the need for the terminal. Ofgem and BERR are addressing offshore transmission separately from the core transmission price controls, Ofwat is handling the Thames Water Tideway project outside the core price control and the Thameslink expansion is handled separately from the main Network Rail price control by ORR. Also, in both the Scottish and Northern Irish water sectors investment has been undertaken on a PPP basis. The contracting out approaches discussed above have generally been for discrete (often large) projects rather than covering most or all of a company's capex programme.

In principle approaches based on tendering or contracting out for new investment can be used both to identify the need for investment, specify its scope and to provide assurance that it is being delivered at minimum cost. Given the range of potential ways to implement this approach it would be important for Ofgem to consider carefully which types of expenditure it would work best for. Implementing these approaches would raise significant challenges for regulators in specifying the core price control (and ensuring that this distinction did not create significant distortions in incentives) and ensuring that tenders or contracts were let on an appropriately competitive basis. For example, the role of the incumbent utility would need to be considered. Furthermore, while for example the use of terminal tendering in the airport sector might allow for a reduction in regulation, it is less clear that this would necessarily be the case if this approach was used for network assets. However, tendering and contracting out can provide mechanisms to lock in financing costs over longer time periods, which provides better value for money for consumers.

Conclusions

From our review of regulatory regimes in other sectors in the UK and abroad, there are different approaches to the specific aspects of the RPI-X framework and different approaches to the more overarching framework that Ofgem could consider as part of its RPI-X@20 review. In particular, regulators have considered some interesting approaches for involving customers in the price review process, setting price controls for more than five years and addressing uncertainty in capex requirements. While there are alternative approaches and ideas to consider, there are also a lot of similarities between the approaches used by different regulators in the UK and abroad. This is unsurprising, particularly in the UK, not least because there are various mechanisms and processes that help ensure a degree of commonality of approach between UK regulators, including that they all have the same appeal body – the Competition Commission.

1. INTRODUCTION

Cambridge Economic Policy Associates (CEPA) has been contracted by Ofgem to provide a review of the use of RPI-X regulation by other network industry regulators. This project is an input to the broader RPI-X@20 review that Ofgem is undertaking. This report has benefited from significant discussion with the RPI-X@20 team at Ofgem.

Throughout this report we have adopted a broad interpretation of RPI-X. We have taken this to mean incentive based (or "performance based") regulation and consequently it covers a very broad range of approaches. The approaches considered in this review have the explicit aim of creating incentives for companies to operate more efficiently. Other approaches, such as traditional US rate of return regulation, may create incentives but this is not an explicit aim of the regime, rather a by-product. This is not to say that rate of return regulation does not have some potential advantages and should be considered alongside the more explicit incentive based regimes. However, since rate of return regulation has been investigated in great detail elsewhere we focus on explicit incentive based regimes in this document.

While there are numerous examples of incentive based regulation around the world it would not be helpful to just list the cases. Rather, we have focused on a subset of the incentives based regimes that either:

- illustrate innovative or different aspects to the way in which Ofgem is regulating; or
- highlight more detail of some of the implementation options for incentives.

This subset of regimes is primarily focused around:

- other UK network regulators;
- Western European regulators; and
- cases from Australia, New Zealand and the Americas.

The report adopts two levels of analysis:

- in the first we provide an overview across 10 regulatory regimes considering a range of characteristics for each regime – this is based on a standardised case study approach for each regime and reported in the annex to this report (Section 2 of the report); and
- in the second we identify areas of regime design that highlight different approaches that Ofgem might consider for all or some of its regimes as the RPI-X@20 review progresses (Sections 3 to 8 of the report). These areas are:
    - the treatment of investment, especially in relation to the determination of the need for investment; the use of outputs; and the treatment of uncertainty;
    - aspects of the overall regime design, especially the role of consumers; use of re-openers; and the treatment of under-utilised assets;

- financial aspects relating to the calculation of the weighted average cost of capital (WACC); and
- the treatment of the risk-return trade-off by regulators.

It should be noted that we do not assess whether any of the alternative approaches would be better suited to British energy regulation than the current regimes. That is not the role for this paper, rather it is a stock take of approaches and a limited discussion of the success, or otherwise, of those approaches in delivering incentives within the situation where they have been used.

Economic conduct regulation is ever evolving and so the cases present just a snap-shot of the way regulation is being implemented at any one time. In some of the cases we highlight where changes are taking place – this could be linked to an ongoing price review (for example, Ofwat, the England & Wales water regulator, is considering two fairly major changes to the regulatory regime as part of the next price review (PR09) process) or a more major review of regulation.

In relation to the latter point there are three other major reviews underway (covering two sectors) in the UK at the moment, apart from Ofgem's RPI-X@20 review, and one interesting overseas review. These are:

- for airport regulation both the Competition Commission, as part of the review of BAA's ownership of the major South East England airports, and the Department for Transport specifically in relation to airport regulation are undertaking reviews (both expected to complete in the first half of 2009);
- in the water sector where the Department for Environment, Food and Rural Affairs commissioned the Cave Review of how greater competition and innovation can be encouraged (expected to complete before summer 2009); and
- in New Zealand where the Commerce Commission has been tasked by the Government, and through the September 2008 Commerce Amendment Act, to establish Input Methodologies for economic regulation (due to complete in 2010).

With respect to the latter, Box 1.1 provides some more detail on what is meant by Input Methodologies.

What is important is that Ofgem's review should not be seen in isolation, many of the issues that arise in the energy sector are arising elsewhere and consequently lessons may also be learned about how other reviews are considering addressing problems.

Box 1.1: Input Methodologies

The New Zealand Cabinet proposed that economic conduct regulation should become more predictable through the establishment of ex ante rules for the bulk of the building blocks involved in any price determination. The Commerce Commission, the regulator for the majority of network industries in New Zealand, was tasked with developing these Input Methodologies.

This Cabinet Decision was enshrined into law when the Commerce Amendment Act 2008 was passed. This required the Commerce Commission to establish a minimum set of Input Methodologies by summer 2010 (with the option of a one-off six month extension). It also provides a range of other options for the Commerce Commission such as Information Disclosure rules so that full price regulation is not the only option available.

Work had been underway on one of the Input Methodologies for some time. A draft proposed Cost of Capital rule has been available from the Commerce Commission website for a couple of years. This provides a possible template for what future Input Methodologies could look like. Further discussion of the issues that need to be addressed and some options for each element of the building blocks for revenue are provided in Section 5 of the December 2008 Discussion Paper.

Sources: Cabinet decision 2006, Commerce Amendment Act 2008 and Dec 19th 2008 Discussion paper: Regulatory provisions of the Commerce Act 1986.

It is also important to note that any review of regulation, the way it is operated and the relative success of the regime cannot be seen in isolation from a range of other factors since regulation does not occur within a vacuum. Key elements that also need to be understood are:

- industry structure – this includes both the vertical nature of arrangements i.e. whether a company provides more than one element of the value chain, and the horizontal nature of arrangements i.e. whether there is a national monopoly for that segment of the industry or local monopolies and multiple companies. Clearly the nature of the structure affects both the implementation of regulation (such as options for benchmarking) and the form of regulation;

- industry ownership – while the question of whether a regulated company is state-owned has been investigated to a degree there are also other aspects that could impact on regulation. For example, common ownership of "separate" companies operating in different parts of the industry could affect the impact of different incentives;

- legal and institutional arrangements – the over-riding framework within which regulation is operating is clearly a key determinant of the regime. Whether the impact is material is not always clear – the arguments about whether not having a licence based system has limited the ability of the CAA to regulate airports are not clear cut – but clearly can be perceived to have an impact; and

- history – once a regulatory agency and regime has been established there is bound to be a degree of institutional history that affects the ability to change. Effectively once precedent has been established it can be difficult for an agency to make significant change – especially when private shareholders exist and legitimate claims for a

"regulatory contract" between the company and regulator exist. This does not mean that change is impossible but that the hurdles for change are higher. Other aspects of history also can have an impact – a decision may be taken for a specific, possible pragmatic, reason but that can be lost in history.[10] An example of this is the rationale for expensing 50% of the iron mains replacement scheme in the British gas industry.

Where possible we highlight aspects of these factors but are limited by both information and scope from pursuing these aspects too far.

The remainder of this paper is structured as follows:

- Section 2 provides a summary of the various regimes that have been reviewed, with case studies for each of the regimes provided in Annex 1 and detailed summary tables expanding on the summary tables from the section in Annex 3;
- Section 3 considers aspects of regulation of investment;
- Section 4 addresses issues linked to the overall regime design;
- Section 5 considers some aspects of the allowed cost of capital;
- Section 6 draws together issues linked around the risk-return trade-off; and
- Section 7 concludes.

A series of annexes then provide further supporting information.

[10] This is in part a reflection of the fact that word and deed can differ. Implementation reacts to situations as they arise while the legal/institutional framework may not adapt to reflect these situations.

2. OVERVIEW

The terms of reference identified a number of areas within the incentive based regime that Ofgem was interested in. We have expanded that to provide a template case study which tries to capture the detail of the regime, plus a small amount of background, within a manageable structure and length. The case studies that have been considered are set out in Table 2.1 below.[11] Ofgem has published a paper on the History of Energy Network Regulation in GB and this has been used to inform the baseline energy regulation characterisation.

Table 2.1: Case studies

Sector/Area	UK	Western Europe	Australia and the Americas
Energy	n/a	France (gas) and Ireland (gas)	US (two states) and Australia (electricity)
Water	Ofwat		Australia
Other	ORR, CAA and PostComm		

Note: other partial cases are used to illustrate points in the following sections but do not have full case studies in the annex.

To provide a manageable overview of the case studies we have broken the analysis down into four areas:

- overall regime;
- treatment of capex;
- incentives – generally focused on incentives to minimise costs and provide an appropriate quality of service; and
- cost of capital/ financial issues.

Each of these is addressed in turn. In each case we provide:

- a brief overview of the existing approach to electricity and gas regulation in Great Britain (our baseline is informed by Ofgem's recent publication noted above);
- an analysis of the similarities and differences between the various regimes; and

[11] It should be noted that we are not considering telecoms since that is the subject of a separate study and have not considered all the UK regulators. Regulators not considered are: NIAUR, the utility regulator for Northern Ireland responsible for energy and water; WICS, the Scottish water regulator; and the specific regulators for some of the smaller islands (Isle of Man, Jersey and Guernsey all have regulators – Isle of Man for telecoms and Jersey and Guernsey have multi-sector regulators).

- any lessons on effectiveness of the different regimes.

The brief overview of the energy regimes acts as a high-level benchmark against which the other regimes can be compared. More detail on these existing energy regimes is available from Ofgem.

In the subsequent sections of the report we focus in more detail on certain aspects of the regulatory regime, some of which expand on one of these four areas, e.g. capex, while others draw on aspects of more than one of the four areas, e.g. the role of consumers.

2.1. Overall regime

Table 2.2 provides an overview of the regimes with respect to four key characteristics:[12]

- length of control – the number of years covered by the formal price control period;
- form of control – what type of price cap, revenue cap or hybrid control has been established;
- use of pass-through – whether some costs within the market segment are ring-fenced from the incentives and passed-through directly to consumers;[13] and
- what types of re-openers exist – re-openers are used to allow a determination to be revisited. They may be general or specific, i.e. triggered by a general situation or a very specific one, and may just review the specific action that has triggered the re-opening or may be a completely new review of all costs and revenues.

Table 2.2 shows that:

- while the UK has primarily focused on five year controls, the evidence from elsewhere is more mixed.[14] Shorter price control periods are seen in some circumstances, even as low as two years, while in others much longer (10 to 20 year) controls have been established. A key linkage exists between the life of the price control period and the options for re-openers;

[12] For the sake of readability and flow we have kept the summary tables at a very high level. Readers wishing to know more about the comparison of the regimes but not wishing to read the detailed case studies will find more detailed comparative tables in Annex 3 of this report.

[13] We have excluded costs that are outside the market segment but which customers still have to pay. For example, the cost of steel may be a pass-through for an electricity network company but we would not count the cost of generation as a pass-through.

[14] Of course, the UK does have some deviations from this. PostComm and WICS have set four year price controls (which used to the length of electricity transmission controls for National Grid in England & Wales) while the OPPPA, responsible for the London Underground PPPs, has price reviews every seven and a half years (although these focus on the incremental costs and revenues rather than the core which is fixed under the 30 year concession agreement). Water in England and Wales initially envisaged having 10 year price control periods while NIAUR is considering a three year initial price control period for water and sewerage in Northern Ireland as part of a transition to five year controls.

Table 2.2: Overall regime

Sector; Regulator	Length of control	Form of control	Use of pass-through	Type of re-opener
UK:				
Electricity; Ofgem	Five years.	RPI-X for transmission and distribution.	Yes, but limited.	Both specific and general.
Gas; Ofgem	Five years.	RPI-X for transmission and distribution with some capex triggers.	Yes, but limited	Both specific and general.
Water and sewerage; Ofwat	Five years.	RPI – X + Q (but referred to as RPI + K), where Q relates to the impact of new investment.	Very limited.	Both specific and general.
Post; PostComm	Four years.	RPI – X with a hybrid of a revenue and price cap.	No pass-through.	General. Rebalancing between the two baskets is possible through a specific re-opener, but no overall revenue change.
Airports; CAA	Five years.	RPI – X and a single-till.	90% of additional security costs.	General may be allowed. A specific asymmetric re-opener had been previously allowed.
Rail; ORR	Five years.	RPI – X + Q (where Q is a volume incentive) with a hybrid of a revenue and price cap.	Traction electricity costs.	General.
Europe:				
Gas transmission and distribution; Ireland; CER	Five years.	RPI – X with separate revenue caps for transmission and distribution.	Yes for non-controllable items.	Not clear if a general re-opener would be allowed but regulatory precedent from airports does allow this.
Gas transmission; France; CRE	Four years for GRTgaz and two years for TIGF.	Mixed: incentive based regulation for opex while capex appears to be a form of rate of return regulation.	Both full and partial pass-throughs allowed.	There appears to be an ability to re-open the control for GRTgaz after two years, but the precise circumstances in which this can happen and the form of the review are unclear.

Sector; Regulator	Length of control	Form of control	Use of pass-through	Type of re-opener
US:				
Electricity and Gas; New York state; NYPSC	Ten years.	Earnings Sharing Mechanism, with a defined acceptable target for Return on Equity.	For upstream costs.	General based on returns earned.
Electricity; Mississippi state; MPSC	Annual.	Regulated return on investment, with performance based component.	No.	Specific for major plant additions and general for financial viability.
Australia:				
Water & sewerage; New South Wales; IPART	Four years.	CPI ± X with separate price caps for water, sewerage and auxiliary services.	For upstream costs.	Not clear but precedent suggests major changes in circumstances can lead to general re-openers.
Electricity distribution; Victoria; ESC	Five years.	CPI – X + S (where S is a service adjustment incentive).	For certain specific costs or events.	None specified.

- a range of regimes exist, with quite different levels of complexity and use of pass-through. This is true cross-sectionally as well as over time. Consider for example the way that energy distribution controls in England and Wales initially started as simple price-caps which then became hybrid price and revenue caps before becoming price caps with a range of cost/ revenue drivers before starting to simplify again. While many regimes have a full pass-through for business rate costs, it is notable that Ofwat, Postcomm and CER in Ireland do not provide full pass-through for these costs; and

- most regimes incorporate re-openers which may be general or specific:

    - general re-openers tend to either be "ship-wreck" clauses, designed to cope with general financial difficulties for a company (as used by Postcomm), or triggers based around returns that indicate that a long-term regime is going wrong and a need for a review exists (examples in the US); or

    - specific re-openers are ways of dealing with the "known unknowns". Significant uncertainty about the movements in an input price index (such as COPI in the water industry) or uncertain timings of projects (such as delays in planning permission for major new terminals at airports, etc) can be addressed through specific re-openers. The use of specific re-openers has become more common in recent years compared to general re-openers.

Two issues need to be considered when evaluating the approaches. First, the choice of overall regime. This is bound, in part, to reflect some of the broader elements discussed in the introduction. For example:

- when multiple companies exist, possibly facing quite different circumstances, a complex regime may be necessary to allow for the differences between the companies. The water and energy distribution regimes in the UK to some degree support this argument;

- if vertical separation has occurred there may be differences in the customers that are being addressed and consequently different implications for the complexity of the regime – transmission companies tend to only deal with a small number of large consumers who know what they need and are able to negotiate with (or express these needs to) the regulated company (this can also be true when intermediaries exist as in airports); and

- history may mean that a regime has developed in a certain way – this is true in airports in the UK and also has clearly affected the way that water and sewerage regulation operates.

As such it is difficult to evaluate whether any of the overall regimes have advantages compared to others. What is clear from the Ofgem publication on the development of energy regulation in GB is that it has developed its regimes over time and allowed some

differentiation between transmission and distribution which is likely to reflect the regulated companies and the requirements of their consumers.

A second area, where it may be possible to be more certain about an evaluation, relates to the length of the price control period. Any choice about the price control period is a trade-off between:

- giving incentives for efficient delivery of services; and
- the uncertainty created about future costs.

While it is the case that the former aspect need not limit a choice of price control period, since an incentive could run for longer than the control period, it is the case that these factors have tended to lead to a standard five year life of price control, especially in the UK. However, examples of longer price control periods which may provide stronger incentives for companies owing to the certainty that they create, do exist. This was an issue that Ofwat revisited prior to the commencement of the next determination (PR09) and while it decided to not change the length of the control period it is clear that there are some possible advantages (and disadvantages) which do deserve further consideration. The general reluctance of UK regulators to adopt price controls for more than five years appears to relate to a concern that the information they would have to rely on to do this would not be of sufficient quality.

2.2. Treatment of capex

A second key set of characteristics relating to an incentive regime relates to the way in which capex is treated. Three main characteristics can be considered:

- how the appropriate level of forecast capex is determined;
- what measures are used to incentivise the efficient delivery of the forecast capex; and
- whether *ex post* measures are applied to assess the efficiency of capex.

Table 2.3 (below) provides an overview of the various regimes against these key characteristics.

The need for investment

When determining the level of forecast capex there is no single common approach adopted. Rather, approaches include:

- cost-benefit analysis to justify investments incorporating either directly collected willingness to pay information or more general evidence on the way that outputs are valued (England and Wales water, Irish airports);
- detailed analysis by engineers of optimal investment requirements and/or analysis of proposed investment plans from the companies (British energy regulation); and

- direct involvement of consumers which can be through discussions between the operator and major customers (referred to as Constructive Engagement in the UK airports sector) or more positive action where large customers take control over acquiring the needed utility assets (such as electricity transmission in Argentina). A variant of this which could be considered is the way that financial guarantees, etc, are needed from new generators or major users on the British energy transmission networks – effectively customer approval is provided by placing money at risk (although the super-shallow pricing approach does limit the relative size of the money at risk for the specific customer relative to all customers).

The specification of what outputs should be delivered by the UK's water and rail sectors includes guidance and prescription from various organisations including the Government and other relevant agencies, such as the Environment Agency in the water sector. Where these organisations provide guidance as part of the price control review about the outputs required, the regulator's role is largely to consider the efficiency of the costs for delivering those outputs rather than whether they are appropriate. Annex 2 summarises the process in the rail sector.

What is clear here is that Ofgem has adopted some, but not all, the approaches seen elsewhere – in fact, in some aspects Ofgem has probably been at the forefront of UK regulation. For example, the way in which large customer involvement, either through auctions or pre-commitment, in transmission provides a strong signal about the need and willingness to pay for investment. Less has been done at the distribution level although the involvement of a consumer panel in the ongoing electricity distribution price determination provides a new example of ways in which customer involvement can occur.

The range of different approaches can reflect the nature and scale of the investment projects. For example, the triggers used by the CAA are likely to be more appropriate and proportionate for very large capex projects such as Heathrow Terminal 5, while the menu regulation approach adopted by Ofgem and Ofwat is better suited to a large number of relatively small investment projects. Indeed Ofwat is providing incentives related to the very large Thames Tideway project outside of the menu.

Do any of the alternative approaches offer advantages relative to Ofgem's existing approaches? Clearly the scale of investment in the water and sewerage industry has forced the regulatory regime to be more detailed and, in some ways, intrusive than that seen for energy. Although much of the determination for the need for investment has been driven by statutory agencies, the use of cost benefit analysis for other investment must clearly be an issue that needs further consideration in energy. Especially since the likely size of the investment programme is increasing relative to what the existing regimes have had to address.

A second aspect of the need for investment is whether the proposed projects are subject to some form of efficiency analysis. Evidence again points to different approaches being used:

- analysis by the regulator and/or engineers of the specific costs of projects (British and Irish energy); and/or
- benchmarking either against common project descriptions (water in England and Wales) or more general benchmarking.

Ofwat has a highly developed set of rules for handling unanticipated investment during the period. This includes logging-up, where the costs are carried by the company until the next review, or interim determinations of K (IDOKs) which are a re-opener discussed earlier in this section.[15]

Ofgem's approach to efficiency has focused primarily on the use of consultants to assess costs. It is fair to say that the evidence on whether the Ofwat approach of benchmarking has provided a better outcome is unclear. Recent evidence on the divergence of regulator and company views about capex suggest that the difference of view could be larger than that seen in energy – consider the "bids" for the water capex menus in PR09. However, the fact that this includes both differences in projects as well as the cost of individual projects makes it hard to determine the real driver.

Incentives to deliver capex efficiently

Most regimes then incorporate some form of incentive to ensure that the projects are delivered as efficiently as possible.[16] These incentives vary and include:

- cost drivers such that volume risk is taken away from the company while leaving the incentive to beat the cost per unit (connection, etc) – used for energy regulation in Britain;
- retention of underspend (sometimes with an *ex post* test for whether it is efficient underspend) for a pre-set period. Some regulators, such as the CAA in the UK and CER in Ireland, continue to allow retention of benefits until the end of the price control period while others have adopted the rolling approach that is popular with energy and water regulators in the UK; and
- triggers are used for some large discrete projects to incentivise timely delivery as well as allowing a fair basis for prices to change to reflect delays in delivery (airports in the UK as well as gas transmission investments in Argentina).

Recently there has been a shift in the approach being adopted in some industries in the UK and "menu" regulation is being employed.[17] The basic approach is similar to the rolling

[15] Where K is the letter used to denote the percentage of the allowed increase or decrease prices each year, relative to inflation.

[16] We do not list the French approach to incentivising investment which is to offer an uplift of 3% on the cost of capital for new projects which expand capacity. This is more aimed at incentivising investment rather than efficient investment. FERC Order 2000 proposed something similar for the US but was never implemented.

incentive, inasmuch as the central level of retained benefits is based on that achieved through the five year rolling approach, but companies have a choice about the trade-off between allowed capex (effectively the *ex ante* efficiency of the **planned** projects) and the level of retained benefits (the efficiency of the **delivered** projects).

Ofgem pioneered the use of menus in the UK and has incorporated them into two price determinations so far, electricity and gas distribution, and is working on updating them for the next electricity distribution price determination. Have they been more successful than traditional approaches to incentivising investment? That is difficult to say since the counterfactual is uncertain and they have not yet been in place for a full price control period. It is probably fair to say that menus have been no worse than traditional approaches and the inclusion of symmetry ought to have an impact over time – although probably more on the planning of projects than the delivery.

Possibly the more important change in the UK, and one that not all regulators have adopted, was that of moving to a rolling system of incentives rather than just allowing retention until the end of the current price control period.[18] Part of the reason for some UK regulators not changing to rolling incentives may be the relatively low importance accorded to investment, say for post, or the belief that the overall regime provided enough incentive, airports. What is clear is that the shift to rolling incentives has helped address the problem of gaming the timing of investment – with companies bunching investment in the first couple of years of a control as a way of maximising benefits. Recent evidence in electricity distribution shows that investment is increasing over the life of the price control period – that may not have been seen under the traditional approach.

An alternative approach to incentivising efficient delivery of capex has been used to a limited extent in the UK and quite extensively in some countries (especially in Latin America) – that of contracting-out. In the UK in the water industry this has focused around the use of public-private partnerships (PPPs) in both Scotland and Northern Ireland. This approach involves the company, or a separate Government agency, seeking bids for stand-alone/discrete projects which the bidder would be responsible for delivering. This approach provides greater transparency and market testing of the cost of investment and consequently ought to provide the efficient cost. There may be some concerns about the loss of flexibility and the consequent payment schedule. These costs would need to be weighed against the benefits of the market testing.

Ofgem has not tended to use this approach, although independent development of connected networks, both gas and electricity, does take place and the plans for the off-shore transmission grid for renewable energy are focusing on a more contracted-out model. While

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[17] This has been referred to as sliding-scale, information quality incentive or capital expenditure incentive schemes by different regulators at different times.

[18] Although Ofgem has adopted rolling incentive mechanisms they have not been applied equally to all segments of the industry and not always to both opex and capex.

the approach may not be appropriate for all investment it is clear that interest in this option is growing – easyjet and Frontier Economics suggested the contracting out of airport terminals as part of the Competition Commission review of airport ownership and regulation. Ofgem could consider the possibility of using more contracting out, especially as investment needs rise.

Ex post adjustments

While the rules for treatment of *ex ante* capex are clear (e.g. the automatic nature of rolling incentives), several regulators retain rights to investigate the efficiency of investment, especially when the outputs from the planned investments are either difficult to quantify and/or measure or there is uncertainty about what investments are needed.

Ofgem had provided one of the clearest statements of how it would act when it discussed its "three pots" approach for gas distribution companies' overspends a couple of years ago. Something similar has been developed by CER in Ireland at the latest gas transmission and distribution review where clarity was provided following the need to undertake some clawback of unspent capex from the previous price control period.[19]

[19] Clawback has been used three times that we are aware of. Ofreg (now NIAUR) undertook clawback of benefits from investment delayed by Northern Ireland Electricity owing to the privatisation process in the 1990s. CAA undertook some clawback from BAA when T5 was delayed in the late 1990s/early 2000s and CER clawed back some underspend from Bord Gais Networks in 2007.

Table 2.3: Treatment of Capex

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
UK:				
Electricity; Ofgem	Transmission – some use of unit cost benchmarking. Distribution – primarily engineering based reviews.	Rolling five year savings incentive (effectively retained even under the IQI menu). Revenue drivers are used for larger projects and projects where demand is uncertain.	Limited *ex post* scrutiny of transmission capex. Distribution under the IQI not expected to face ex post review although this is under discussion.	
Gas; Ofgem	Transmission – some use of unit cost benchmarking. Distribution – primarily engineering based reviews.	Rolling five year savings incentive (effectively retained even under the IQI menu). Revenue drivers are used for larger projects and projects where demand is uncertain.	Role of customers for most transmission capex *ex ante*, there is limited need for *ex post* scrutiny. Distribution under the IQI not expected to face ex post review although this is under discussion.	Capex to replace iron mains on the gas distribution network for safety reasons has been partly expensed (50%).
Water and sewerage; Ofwat	Determined *ex ante* based on company estimates and justified on the basis of cost benefit analysis. Unit cost review and more general efficiency assessment. Plan to move to IQI like menu.	Asymmetric rolling five year basis. Plan to move to menu system with symmetry as part of the ongoing price review (PR09) and retention levels similar to existing levels.	None for planned investment. Logging-up leads to *ex post* reviews of the need for the investment.	Depreciation of infrastructure and non-infrastructure assets done in different ways with some incentive implications. Role of quality regulators with respect to "change protocol" etc.
Post; PostComm	Determined *ex ante* based primarily on a bottom-up assessment of specific plans put forward by the company.	Savings retained for life of the price control. Over-spend dis-allowed unless captured under specific rules/re-openers.	The policy has not been articulated.	None.

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
Airports; CAA	Determined *ex ante* through "Constructive Engagement" between stakeholders, as well as being subject to efficiency reviews by the regulator.	Underspend and efficient overspend are reflected in the roll forward of the RAB at the following price review. Triggers are used for major capex projects.	Some analysis of out-turn, especially over-spend. Regulator retains discretion to allow over-spend and has tended to incorporate it into the RAB.	"Wash up" mechanism for out-turn capital expenditure in the final year of the previous control period. The company appears to receive forecast depreciation irrespective of actual capex. Pre-funding of major projects is allowed.
Rail; ORR	Determined *ex ante* based on company estimates, subject to a review and adjustment for efficiency gains by the regulator.	Efficient overspend and efficient underspend are borne/retained for the remainder of the control period.	Efficiency evaluation for overspend. If allowed is incorporated into the RAB, including capitalised finance minus 25%.	Depreciation set on a long-run basis.
Europe:				
Gas transmission and distribution; Ireland; CER	Determined *ex ante* based on a bottom-up review of the company's business plan and proposed capex. Some international and functional benchmarking.	Underspend and efficient overspend are reflected in the roll forward of the RAB at the following price review. Some use of triggers.	Capex overspend is subject to an *ex post* efficiency evaluation.	Additional rules for major capex give the regulator an additional chance to consider costs.
Gas transmission; France; CRE	Determined *ex ante* based on company estimates, subject to a review and adjustment for efficiency gains by the regulator.	Unanticipated savings are kept for the remainder of the price control period.	None.	Includes pre-funding of assets during the planning phase of major projects. 3% uplift on cost of capital for 10 years for certain types of investment.

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
US:				
Electricity and Gas; New York state; NYPSC	N/A.	N/A.	N/A.	Depreciation of larger projects undertaken in a different way.
Electricity; Mississippi state; MPSC	Some consideration, primarily linked to impact on prices with limits for increases.	None.	Some assessment of impact of actual costs with a "wash-up" but constrained by impact on prices.	"Major Plant Additions" are handled through a separate process.
Australia:				
Water & sewerage; New South Wales; IPART	Determined *ex ante* based on company estimates, subject to a review and adjustment for efficiency gains by the regulator.	Unanticipated savings are kept for the remainder of the price control period. Overspend, unless captured in specific controls for specific incentives, is excluded.	None.	None.
Electricity distribution; Victoria; ESC	Regulator set capex level for each company based on a 30% increase from capex incurred in the previous control period.	Rolling five year efficiency mechanism. Is to be stopped for capex at the end of the existing control.	None.	None.

2.3. Incentives

Regimes incorporate a range of incentives apart from those linked to capex and discussed in Section 2.2 above. The areas where incentives may be created include for:

- operational efficiency; and
- service performance – which can be linked both to individual customer service (guaranteed standards) or more general network performance.

Further, any regime can be characterised by the degree of sharing (retention of benefits) and the degree of symmetry in the incentives incorporated within the regime.

Table 2.4 summarises the information on these characteristics of incentives. Key themes include:

- a general situation of asymmetric incentives with overspend being treated differently to underspend and often overspend not being allowed at all. This has changed for capex with the introduction of menu regulation in energy and planned for water which embodies symmetry but is not formally seen elsewhere and is not the standard approach to opex; and
- in several industries in the UK and in one of the overseas cases the adoption of either rolling benefit retention or the setting of incentive rates in menus on the basis of the level of retention seen with rolling retention. There are, however, cases such as the CAA's treatment of airports in the UK and cases overseas where benefits are only retained to the end of the price control period in which the savings are made.

When it comes to service quality there is a fairly common approach in the UK based around:

- customer guaranteed standards which if broken lead to specific payments to the consumer affected; and
- general performance requirements which can lead to penalties (and sometimes bonuses) applied across all revenue.

With the general performance requirements it is also often the case that the amount of revenue that is at risk is limited in any one year – none seem to go above 10% of revenue. However, this could be a significant amount of revenue – possibly reducing the returns to investors by a third (given the capital intensive nature of utility companies profits may account for around 30% of the total allowed revenue). It is unlikely that the amount at risk is sufficient to potentially push a company into losses in a year but with a highly geared company there would be the risk that shareholders would earn no return in a year.

The overseas experience, especially in Australia and to an extent in the US, is similar to that of the UK. There is an issue as to whether the incentives are calibrated in an appropriate manner – this is discussed later in the report.

Table 2.4: Incentives

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
UK:				
Electricity; Ofgem	Transmission – Asymmetric. Distribution – Symmetric under IQI menu. Asymmetric for opex.	Rolling incentive system implemented in one year. No provision for overspend other than for pre-specified re-openers. Specific incentive schemes, generally with caps, collars and sharing factors.	Combination of revenue adjustments and direct compensation payments to suppliers and customers. Liability for payments is generally capped.	Usually a limitation on downside exposure for the company, but increasingly symmetric.
Gas; Ofgem	Transmission – Asymmetric. Distribution – Symmetric under IQI menu. Asymmetric for opex.	Rolling incentive system proposed but not implemented. No provision for overspend other than for pre-specified re-openers. Specific incentive schemes, generally with caps, collars and sharing factors.	A combination of revenue adjustments and direct compensation payments to suppliers and customers. Liability for payments is generally capped.	Usually a limitation on downside exposure for the company, but increasingly symmetric.
Water & sewerage; Ofwat	Asymmetric. Proceeds from sale of operational land are shared 50:50.	Unanticipated savings are kept by the company for five years in a rolling system. Overspend is excluded.	A combination of revenue adjustments and direct compensation payments to suppliers and customers.	Asymmetric.
Post; PostComm	Asymmetric.	Unanticipated savings are kept for the remainder of the price control period. Overspend, is excluded in all but specific circumstances.	Revenue adjustments (capped) which are either paid as direct compensation or reduced prices.	Asymmetric. Royal Mail bears volume risk.
Airports; CAA	Approaching symmetry.	Underspend and efficient overspend are kept for the remainder of the price control period.	Quality based measures with a cap and collar for impact.	Asymmetric.

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
Rail; ORR	Symmetric.	Efficient over- and under-spend are borne/retained for the remainder of the control period.	Direct compensation and revenue adjustments allowed under various schedules.	Asymmetric.
Europe:				
Gas transmission and distribution; Ireland; CER	Approaching symmetry.	Unanticipated savings kept for remainder of price control period. Overspend is excluded.	None.	Approaching symmetry.
Gas transmission; France; CRE	Approaching symmetry.	50:50 sharing of any efficiency gains achieved during the price control period.	Some aspects of performance are subject to a financial incentive.	Asymmetric.
US:				
Electricity and Gas; New York state; NYPSC	Effectively symmetric although degree changes in bands.	None.	Capped penalties may be applied if satisfactory service levels are not met. Whether paid directly to customers depends on value.	None.
Electricity; Mississippi state; MPSC	Symmetric.	None.	Two measure for incentivising service performance.	Symmetric.
Australia:				
Water & sewerage; New South Wales; IPART	Asymmetric.	Unanticipated savings are kept for the remainder of the price control period. Overspend, is excluded in all but specific circumstances.	A set of specific output targets for water and wastewater services.	Asymmetric.
Electricity distribution; Victoria; ESC	All efficiency gains within control period retained by companies.	Efficiency gains from opex underspend retained under a rolling five 5 year mechanism.	Both direct payments to customers and general impacts on revenue possible.	

Incentives related to opex and quality of service developed more incrementally than radically in the UK and elsewhere. Opex incentives in particular, tend to be quite similar in nature to those which applied at the time that RPI-X regulation was introduced, with the exception of the use of rolling incentives. Perhaps the main area where there has been greater innovation for opex incentives relates to the use of discrete incentives such as Ofgem's incentives for National Grid's system operator costs. In this case the basic incentive to minimise costs is supplemented by some caps and collars to minimise the up and downside for the company, and a sharing factor relating to under and overspends compared to the target. We have discussed above the use of pass-throughs which reduce the amount of opex covered by incentives.

Quality of service regulation has evolved incrementally as regulators have increased their knowledge about customers' needs and willingness to pay. This has generally led to small changes to quality of service incentives in ways that regulators' consider better reflect the needs of customers. There is limited evidence of direct negotiation between customers and companies to set quality of service incentives.

2.4. Financial issues

The allowed cost of capital has proven to be one of the most controversial issues in regulation throughout the world. Not only does it play an important role in terms of the revenues that a company is able to earn, given the capital intensive nature of most network industries, it also:

- determines the likelihood that a company will be able to finance its functions since the allowed cost of capital is expected to provide the remuneration for the existing funding of the company; and
- provides a key incentive for investment since only investment that is able to earn more than the allowed cost of capital will be undertaken.[20]

When thinking about financial issues it is useful to consider:

- the basic approach to estimating the allowed rate of return, this encompasses whether it is all capital or just equity under consideration and the overall approach (or mix of approaches) used to estimate the value;
- how inflation and tax are addressed, this has an important impact on the profile of required revenues and consequently prices;
- the time horizon over which the calculation is made;
- the basis of estimating the risk-free rate;

[20] It is in this role that the additional 3% offered by the French energy regulator for gas transmission investments that address capacity issues should be viewed.

- the treatment of embedded debt;[21] and
- assessing the financeability of the price control settlement.

Each of these are addressed in this report, the basic approaches adopted by the various regulators are summarised in Table 2.5 and additional details are provided in Section 5 of this report.

Given the role played by the Competition Commission as an appeal body and the relatively frequent statements made concerning estimating the allowed cost of capital it is unsurprising that there is a fairly high degree of commonality of approach in the UK. This has been further reinforced through the joint work undertaken by the UK regulators (which resulted in the "Smithers" report). However, there are some differences and these are highlighted in the summaries below.

2.4.1. Approach to cost of capital estimate

There is a surprising overall degree of commonality across the cases with the overall approach:

- all cases except the US focus on the weighted average cost of capital (WACC) although there is less consistency as to whether this is a post-tax or pre-tax estimate (discussed later in this section); and
- the US cases tend to focus on the return on equity with the cost of debt treated more as a cost pass-through item.

However, the consistency of approach is less clear when it comes to how the WACC is calculated. Differences primarily exist with the estimation of the return on equity:

- most regulators use the Capital Asset Pricing Model (CAPM) in some form as the main source of information, or in the case of Australian regulators as the only source;
- many regulators also supplement the CAPM estimate with other approaches, such as the Dividend Growth Model (DGM) or some form of market data, such as the Market to Asset Ratio data considered by some UK regulators; and
- US regulators have a much more formal approach to weighting together the various estimates, primarily based on precedence with the DGM having the greatest weight.

Overall it would appear that the differences are limited, especially when UK examples are considered. However, the relative weight given to different sources of information is an

[21] This is debt borrowed in previous price control periods and which may have a higher or lower cost than the cost of debt allowed for the current price control period.

issue that could be considered further, and to some degrees requires an interpretation of the meaning of regulator's statements about their decisions.

It is notable that although the cost of capital is supposed to reflect the overall risk adjusted return required by the regulated company, it is often unclear how the regulator has taken account of other mechanisms within the price control settlement to manage risk when setting the cost of capital. It appears implicit in most regulatory determinations that the other mechanisms are expected to be neutral with regard to managing uncertainty or in terms of an expected value, but this is rarely stated explicitly. It also not uncommon for regulators to retain a similar or the same value for the cost of capital between the initial and final proposals while adjusting other mechanisms to reduce the uncertainty for the company. The consistency of this approach is often not explicitly explained.

2.4.2. Specific elements of cost of capital and financial issues

Treatment of inflation and tax

Both tax and inflation are important elements of any determination of the WACC.

With inflation there appears to be fairly unanimous agreement on the setting of a real or inflation adjusted WACC, only in the US and in New Zealand do they focus on a nominal estimate which includes inflation (this has implication for both the treatment of the assets valuation and the profile of revenues).

Taxation treatment is much less clear. Two basic approaches are utilised:

- a pre-tax estimate is made which incorporates any tax; or
- a post-tax estimate is used with taxation handled in a separate way.

Even in the UK there is a lack of consistency with the treatment of taxation.

Other differences relate to the tax treatment of dividends for overseas shareholders relative to domestic shareholders. UK regulators adopt a position of assuming all shareholders are treated the same while other countries, especially Australia, allow for separate treatment.[22]

Given the importance that tax can have, especially when significant levels of investment lead to a divergence between statutory and effective tax rates, this is an issue that Ofgem should keep under review.

[22] Neither approach is necessarily more right than the other. Their use partly depends on the tax treatment in the country. If an "optimal" shareholder base is considered then either treatment should provide the regulator with a treatment that creates a minimal incentive for the company to try to focus on certain shareholder groups. This difference of approach may also reflect the fact that most UK regulated companies are part of a larger company rather than a stand-alone listed company with direct shareholders.

Time horizon

In principle when choosing the funding for an asset a company will try to match the duration of the asset with the liability – so for very long-lived assets like those in infrastructure networks one would expect long maturity liabilities. However, when it comes to estimating the allowed rate of return regulators are often faced with the problem of not having reliable data about long-lived liabilities.

There is no single approach when the risk-free rate is considered. Even within the UK there is a significant range of different maturities or mixes of maturities considered.

Estimating the real risk-free rate

As noted earlier, there is no real consistency in the way that an inflation adjustment is made. This is partly because different countries have access to different types of instrument – in the UK, Australia, US and some continental European countries Governments have issued index-linked bonds which remove the majority of inflation risk.

Treatment of embedded debt

There is the question of embedded debt – the situation where a significant difference between the backward looking and forward looking costs of debt exists. Only a few regulators have directly addressed this issue during determinations and only one UK regulator has explicitly allowed an embedded debt premium (Ofwat in PR99). There has, however, been significant discussion by both companies and regulators of various ways in which embedded debt problems may arise and how they could be treated.

Assessing the financeability of the price control settlement

Most UK regulators now carry out an assessment of whether the regulated company could "finance" the regulatory settlement. Although there are differences in the detail of the approach adopted by each regulator, in broad terms this involves considering whether the regulatory settlement would allow companies to meet a range of financial ratios consistent with achieving a comfortable investment grade credit rating. Where regulators have had concerns about whether a price control settlement is "financeable" they have generally either provided for bringing forward depreciation payments in an net present value (NPV) neutral way (Ofgem), or allowed additional revenue (Ofwat).

These issues are discussed in more detail later in this report.

Table 2.5: Overall approach to the cost of capital

Country	Sector	Year	WACC	Approach to risk/cost of capital assessment		Real	Treatment of tax
UK	Airports	2008	Pre-tax WACC	CAPM	n.a.	Real	Statutory rate in tax wedge calculation
UK	Water	2004	Post-tax WACC	CAPM	Market based evidence: DGM, transactions-based approach, MAR	Real	Company-specific expected effective tax rate
UK	Rail	2007	Post-tax WACC	Market based evidence: DGM, MAR	CAPM, regulatory precedents	Real	Capital allowance – Network Rail's expected tax payments, but adjusted for overfunding in CP3
UK	Telecoms	2005	Pre-tax WACC	CAPM	Cash-flow real option analysis	Nominal	Statutory rate in tax wedge calculation
UK	Post	2005	Pre-tax WACC	CAPM	n.a.	Real	Statutory rate in tax wedge calculation
New Zealand	Gas	2008	Post-tax WACC	Variant of CAPM	Comparative analysis with international examples	Nominal	Statutory rate in tax wedge calculation
Australia (Victoria)	Water	2005	Post-tax WACC	CAPM	n.a.	Real	
Australia (Victoria)	Electricity distribution	2005	Post-tax WACC	CAPM	n.a.	Real	Tax allowance based on projected liabilities for prescribed services
Australia (NSW)	Water	2008	Pre-tax WACC	CAPM	DCF and comparable earnings	Real	Statutory rate in tax wedge calculation
US	Electricity	2002	Return on equity	CAPM, ECAPM, risk premium		Nominal	
US	Electricity	2001	Return on equity	Base rate estimated by using a discount rate of a group of A rated utilities and taking into account the company's equity ratio. Additional earnings are allowed up to a cap above which further earnings are shared			
Italy	Gas	2008	Pre-tax WACC	CAPM	n.a.	Real	Statutory rate in tax wedge calculation
Holland	Gas and electricity distribution	2005	Pre-tax WACC	CAPM	DGM	Real	Statutory rate in tax wedge calculation

2.5. Summary

This overview of the various approaches to incentive regulation and the way in which key elements of the regimes have been determined illustrates that:

- in some areas such as length of price control, form of general re-opener and elements of the financial determination there is a great deal of conformity around the world; but
- in other areas like tax treatment, degree of sharing for incentives and the way in which capex requirements are determined there is much less consistency.

This is also not only true between the UK regulators and those in other countries but also between UK regulators for some issues.

It is also clear that Ofgem (and its two predecessors Offer and Ofgas) has been one of the more innovative regulators and has tried many of the various approaches when the main price controls for electricity and gas transmission and distribution are considered over the last 20 years.

Even so, there are areas where further consideration of alternative approaches would be appropriate. The key areas for these are considered in the following sections of this report and then some tentative conclusions about areas where Ofgem might want to consider change are given in the concluding section.

3. INVESTMENT

3.1. Introduction

Possibly the area where the greatest concern with incentive based regulation, especially RPI-X regulation as practised in the UK, has been raised is that of investment. While some of these concerns may be over-stated, it is clear that in general improvements to the way in which investment is handled could occur. So, while incentive based regulation has clearly delivered significant investment in some industries, such as water and sewerage, there have been concerns raised by the Competition Commission about the way that airport investment has been undertaken and in general there is a concern that investment plans are over-stated with companies then benefitting from the "savings" made during the price control period.

As identified in Section 2, there are three different elements to the way that capex is handled:

- the *ex ante* identification of what investment is necessary;
- the creation of appropriate incentives for efficient capex delivery; and
- *ex post* assessment of efficiency.

Within these three areas there are aspects that Ofgem could consider. Specifically:

- the role given to consumers when determining *ex ante* the need for investment; and
- designing appropriate incentives.

There are three aspects of this latter issue that are considered in this report:

- the way that investment is linked to outputs – this also ties across to the *ex ante* determination of the need for investment;
- ways in which uncertainty can be handled; and
- whether contracting out provides an alternative way of ensuring appropriate incentives for efficient delivery of capex.

3.2. Involvement of consumers in determining the need for investment

As seen in Section 2, this is an area where there is much less commonality of approach.[23] There are, however, two main UK examples of the way that customers can be involved.

In the water sector the companies are required to undertake significant customer surveys prior to each price review to establish willingness-to-pay (through contingent valuation methodologies). This information is then used as an input to a cost benefit analysis (a two

[23] Here the focus is on the specific role of consumers with respect to investment. Other aspects of consumer involvement in price determinations are addressed in a later section of this report.

stage process has been implemented by Ofwat to capture the private and public nature of the services) with projects required to meet the cost benefit test for them to be guaranteed inclusion in the capex programme.[24]

The CAA, responsible for regulating UK airports, introduced a new approach to customer involvement through what it termed Constructive Engagement (which was also used for some of the other building blocks of the price determination). This was a process between the airlines operating at an airport and that airport's management – Box 3.1 describes the approach in some detail.

In some respects Ofgem has used something similar but more as a way of dealing with uncertainty about investment programmes during a price control period. As part of the "three pots" approach to investment for gas distribution companies, Ofgem accepted that if unanticipated investment occurred which had the support of customers then it would accept that it was appropriate investment and consequently incorporate this into the regulatory asset base accordingly.[25]

There are also examples of customer involvement in other countries. Possibly the best documented approach is that of the Argentinean electricity transmission sector where sufficient customers have to want an investment before it occurs and they are also responsible for a competitive tender to determine which operator will deliver the investment.[26] This takes the role of customers a step further than has been generally envisaged in the UK – although some of the experiments with Independent Gas Transporters (IGTs), etc, in the energy sector share some characteristics with this more extreme Argentinean approach.

3.3. Investment incentives and output definition

A lot of the debate and discussion about RPI-X regulation focuses on how operating and capital expenditure (opex and capex) is forecast by the company and regulator, but there is relatively little focus on the setting of quality of service or other output measures that are to be delivered with the expenditure. However, without robust measures of what is to be delivered for the allowed expenditure there is a real danger that companies' will underspend their allowances and argue that this results from efficiency savings, when it actually results from failing to deliver satisfactory outputs for customers. It may be particularly difficult for the regulator to identify that unsatisfactory outcomes have arisen if the impact of failing to undertake adequate investment is not apparent for a number of years into the future.

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[24] Projects that are counted as critical by Ofwat but which do not meet the cost benefit test are also included in the programme. It is likely the process will be less clear cut than proposed since grey areas are bound to arise.

[25] Described in *The Regulation of Investment in Utilities: Concepts and applications*, Alexander & Harris, 2005.

[26] *Regulation of transmission expansion in Argentina*, Littlechild & Skerk, 2004, plus *The Regulation of Investment in Utilities: Concepts and applications*, Alexander & Harris, 2005.

We discuss how regulators have approached this issue so far, which has predominantly focused around a combination of quality of service measures and incentives, together with input measures for capex. We then discuss the increasing move to seek more output based measures of the effectiveness of capex.

3.3.1. Quality of service incentives

All of the UK regulators and most of the examples we have considered from abroad include within their RPI-X price regulation, measures, usually accompanied by financial incentives, of the quality of service delivered to final customers. Examples include reliability targets for the percentage of mail delivered within the specified timescales for Royal Mail and targets for the performance of various elements of the airport experience at Heathrow and Gatwick airports. The amount of money at stake for these various quality of service targets varies between regulators. There is also a mixture between measures that provide direct financial recompense to affected customers, e.g. the bulk mail compensation scheme in the postal sector, and measures that result in general reductions in future allowed revenues that are not attributed to specific customers, e.g. the schemes at Heathrow and Gatwick airports. Quality of service regulation of electricity distribution networks is a mix of these two elements, with guaranteed standards of performance resulting in compensation being paid directly to affected customers, while there are also quality of service measures that have penalties or rewards delivered through changes in allowed revenue.

The particular measures to be covered in each sector and the sum of money that should be at stake appears generally to be a function of a combination of research of customer preferences, issues regarding the practicality of robustly measuring certain factors, and a degree of regulatory judgement about what would constitute a reasonable quality of service in a more competitive market. Regulators have generally struggled to effectively link customers' willingness to pay for different levels of quality of service with the costs of delivering such levels of quality of service. This appears to reflect a combination of the limitations of willingness to pay research techniques and the difficultly of estimating robustly the incremental costs of different levels of service.

As many regulators have had these arrangements in place for a period of time they appear to work relatively well, and have often been fine tuned as lessons are learnt from historical performance, and changing customer views. Nevertheless, to varying degrees regulators have been concerned that these measures are not sufficiently comprehensive to assess whether customers are receiving value for money for the expenditure companies are allowed. This concern has been greatest for capex rather than opex, particularly because the outputs from capex may be spread over many years into the future.

Box 3.1: Constructive Engagement in the airports sector

Constructive Engagement (CE) between airport operator BAA and its consumer airlines with regard to capex plans as well as setting service standards was introduced by airport regulator CAA in 2004 after the previous arrangement, outlined in Annex 4 of the CAA's February 2003 price control determination document, was deemed insufficient. This previous approach itself was created following concerns about the degree of consultation regarding capex and its impact on the allowed airport charges, as well as questions of whether BAA has acted against the public interest. While not a formally binding document, Annex 4, required BAA to produce a central business plan covering at least the next 10 years and setting out a range of assumptions and projections (such as forecast demand, cost estimates for capex projects, etc.) that will allow airlines to gain a better appreciation of factors that influence BAA's revenue requirement.

BAA, however, restricted its disclosure to simply producing an annual capital investment plan (CIP). As a result, ahead of its fifth price review (Q5) of the three major London airports, the CAA set up CE between BAA and its customer airlines at each individual airport. At Heathrow and Gatwick, where capacity constraints made it in the interest of both sides to see capex increase, CE was seen as an improvement over the previous consultation process, although some areas of disparity between stakeholders persisted, as evident by the delays to Heathrow East Terminal. At Stansted, where low-cost airlines dominate, while BAA would have liked to embark on major capex projects, the process of CE never got off the ground and was terminated by the CAA in December 2005.

The stand-off at Stansted resulted in each side placing the blame with the other; BAA claimed that it had made considerable effort to engage in CE with the airlines but was frustrated by their preconditions, while airlines, in turn, argued that the information provided to them by BAA was insufficient to effectively engage in consultation. The impasse mainly originated from the fact that BAA provided airlines with a CIP, while the latter deemed this insufficient and sought a full business plan, in accordance with Annex 4.

The Competition Commission's (CC) Inquiry of the Stansted price review sided with the airlines on this matter, arguing that BAA showed a "lack of responsiveness to the interest of airlines and passengers that we would not expect to see in a business competing in a well-functioning market". In particular, the CC highlighted several aspects of the current CE format which it deemed to exclude genuine two-way dialogue between BAA and airlines and which it argued hampered the process not only at Stansted, but also at Heathrow and Gatwick. These factors include:

- BAA's considerable advantage owing to asymmetrical information;
- the scope for BAA to take advantage of airlines' different requirements and potential to play airlines off against each other;
- BAA's ability to control the timing of the release of information; and
- the absence of a dispute resolution procedure.

The final point led to some comment about the CAA who the CC claimed relied on CE but did not set up an adequate back-up plan. For its part, the CAA argued that CE was never meant to determine all facets of airport operations, but rather to provide inputs to the price control process with regard to items which were not zero-sum, such as the cost of capital, or which relied on commercially confidential data, such as airports' retail revenue.

The failure of CE at Stansted led to the CAA using its own projections in setting up building blocks of the revenue requirement. The CAA also produced a more detailed version of the old Annex 4 (now Annex F in the December 2008 price control proposals document), which sets out the information BAA must present to airlines at various stages (before, during and after) of capex projects, although the demand for a business plan remains conspicuous by its absence.

Sources: Competition Commission (2008) 'BAA airports market investigation: initial findings report' and Civil Aviation Authority (2008) 'Stansted Airport: CAA price control proposals'.

3.3.2. Input measures

The initial response of regulators to the concern that the quality of service measures were not sufficient to assess the value for money of capex was to focus more on input measures to assess the need for and value of capex. This can be seen in a number of approaches, including:

- Ofwat's use of detailed and extensive benchmarking of capex to ensure that projects included in the price control allowance are required. For its current price control review Ofwat is requiring the water companies to prepare robust cost benefit analyses of specific capex projects to ensure that there is a business case for the expenditure.
- The use by Ofgem, CAA and CER for the Irish gas sectors of triggers or other cost drivers where the precise scale or timing of investment is uncertain. Triggers can be designed in various ways, but they are generally used to ensure that regulated companies do not get remunerated for capex that is not needed or before it is needed. The use of triggers for the Heathrow airport Terminal 5 project has generally been seen as a success as the project was delivered on time. Subsequent problems with the initial operation of the terminal were not obviously related to the operation of the triggers.
- Greater requirements for customer support for the project need to be demonstrated. Again CAA through constructive engagement between airports and airlines, and Ofgem through the use of auctions for gas entry capacity and user commitment for other assets that directly benefit particular users are the best examples of this approach.

These approaches, and particularly the last two, are likely to work best for large investments or investments where a single or small number of well informed customers will benefit. Gas and electricity transmission, and airports are therefore good opportunities to apply these approaches. It is much less clear that such approaches can work as effectively where investments are much smaller in scale and benefit a much wider and less well informed set of customers. Water, and gas and electricity distribution are good examples of such sectors.

Input measures also tend to work best where the regulator treats capex as a combination of specific projects rather than an overall allowance. Where capex is treated as an overall allowance to deliver some desirable outcomes it is less clear that input based measures are an appropriate way to assess its effectiveness. Hence input measures have tended to be used by regulators where they assess individual projects rather than make a higher level and more overall capex allowance.

3.3.3. Output measures

Therefore, while input measures can be seen as part of the solution to concerns about the accountability of companies for their capex, it is not clear that it satisfactorily addresses concerns about capex, particularly for companies with a large number of relatively small capex projects and a relatively diverse customer base. Output measures, if they can be developed, may also be more effective where regulators allow an overall amount of capex rather than focusing on the value for money of each individual project. Furthermore, focusing on inputs rather than outputs means that the actual impact of the project is not necessarily assessed, and companies may be able to deliver a project more cheaply while meeting the input triggers, but harming outputs in the longer term.

Given these concerns regulators are increasingly trying to identify options that better measure the outputs delivered by companies. Ofgem currently has output projects for transmission companies and it is a key part of the electricity distribution price control review. Ofwat is also trying to develop output measures for water companies as part of the PR09 price control review. There are some difficulties with the approaches of Ofgem and Ofwat:

- Ofgem's approach relies to a large extent on the electricity distribution companies to provide initial suggestions for appropriate output measures, which Ofgem will then evaluate. This creates a risk that the companies may be able to exploit their superior knowledge in the setting of the measures.
- Ofwat's approach relies on a very intensive scrutiny of company plans to attempt to a substantial degree to eliminate the impact of asymmetric information. However, this approach can substantially increase the regulatory burden.

From our review of examples in other countries it appears that the UK is ahead of most other countries in this regard, and there are few examples of the use of sophisticated output measures. The French energy regulators recent price controls for the gas transmission companies include a form of output measures in that the rate of return that the companies can earn for investments is higher where it can be demonstrated that the effect of the investment is to reduce internal congestion and/ or reduce the number of balancing zones. However, this is a relatively qualitative output measure, and has some characteristics of an input measure.

3.3.4. Conclusion

Developing robust output measures can be seen as one of the characteristics of an effective system of RPI-X regulation that regulators have strived to achieve, but so far with only limited success. As a result regulators have generally relied on a combination of quality of service measures and input triggers to provide accountability for the expenditure they have allowed the companies. Ofgem's latest projects to develop output measures are amongst the most significant attempts to make progress on this issue.

3.4. Triggers and Other ways of Handling Timing Uncertainty

An issue that some sectors have been forced to address is the significant uncertainty that can arise around major investment projects – for example, new terminals at airports (Heathrow Terminal 5, Terminal 6 and the third runway), major energy transmission expansion/ reinforcement (the new entry pipeline in Ireland linking the Corrib field to the on-shore transmission network) and new reservoirs (Thames Water's new Abingdon reservoir). The uncertainty here is not so much about the need for an investment or even the cost of the investment but the actual timing of the investment.

Timing problems may arise for one of the following reasons:

- uncertainty about when demand will be sufficient to justify the investment;[27] or
- planning and other legal requirements may be subject to significant uncertainty either owing to public involvement in the process or new processes being employed.

While this may not have been a major concern in the UK energy sectors to date, the increasing dependence on renewable generation sources and the investment requirements both on-shore and off-shore to deliver power to the load centres could lead to Ofgem facing similar issues.

A linked issue occurs when both volume and timing are uncertain, this is also discussed here.

3.4.1. Current arrangements

Four different approaches have been used to date for timing uncertainty (although three of the approaches are also used more generally to address issues other than timing uncertainty for investment). They are:

- logging-up – this is used extensively in the water industry as a way of capturing less material uncertain investment (and other cost) requirements. The basic approach involves keeping a "log" of the expenditure and then reviewing those expenditures at the next price review;
- interim determinations (re-openers) – this approach is used for material unforeseen costs and involves a mini- (or mid-term) price review. It has been available in the water and airport industries in the UK and was recently used for airport regulation in Ireland when new plans for the second terminal envisaged a significantly more expensive project than originally planned;
- cost drivers – this is an approach that Ofgem has used extensively albeit primarily for uncertain volumes rather than timing (although the impact is the same). A per unit

[27] A linked question of how under-utilised investments are remunerated is addressed in another section of this report.

charge, say for connection of new generating capacity, is established and then that per unit charge is multiplied by the actual volume as it happens; and

- triggers – a revenue impact for a specific project is determined and then revenues are adjusted if the project is delayed from the forecast date. Triggers can be positive or negative:
    - positive triggers are ones where revenue is increased if the event occurs – an example of this is provided in Box 3.2 below; and
    - negative triggers are ones where revenue is decreased if an event does not occur – an example of this is provided in Box 3.3 below.

In terms of the implementation of the approaches each appears to have worked successfully in different sectors. The water sectors extensive use of logging-up and interim determinations (IDOKs) has been viewed as successful – although they have not accounted for a significant amount of the total investment undertaken.

Cost drivers have been used most extensively in the energy sectors and it would appear that there is uncertainty about their continued use. At the last gas distribution price review cost drivers were dropped while the latest electricity distribution price review consultation document has suggested that cost drivers may be continued into the next price control period. In principle they are a good way of handling uncertainty but probably more so with volume for smaller projects rather than the timing of major projects. It can be argued that when applied to major projects they effectively become triggers.

The use of triggers is much more limited in terms of experience. In UK airports they do seem to have been successful but the CAA's decision to not apply them to the Project for the Sustainable Development of Heathrow (PSDH – effectively Terminal 6 and Runway 3) is difficult to understand. Further, the focus in the UK on negative triggers may provide a perverse incentive for companies to complete a project even if it should be delayed – this would obviously also be affected by the size of the adjustment to revenue compared to the underlying cost of the project.

Triggers have been used in other industries in other countries. Box 3.2 provides an example from the Argentinean gas transmission industry. In Ireland the energy regulator adopted a positive trigger associated with costs that would be incurred if gas supplies from the Corrib field were delayed beyond October 2009. It is possible the robustness of this trigger will be tested in the next year.

Box 3.2: Use of positive triggers in Argentina

Since 1992, transmission of natural gas in Argentina has been provided by two regional monopolies: Transportadora de Gas del Sur in the south and Transportadora de Gas del Norte in the north. At the same time, a law came into force which regulated the tariffs these two companies were allowed to charge gas distributors. Regulation has taken the form of RPI – X + K, where K is a factor associated with investment during the control period, which normally would last five years, although the ruling of 1997 has remained in place since the country had been plunged into a deep recession in the early part of this decade.

During the price review, each company submits its investment plans for the five-year period ahead. The regulator (ENARGAS) then approves these plans on a project-by-project basis and sets a value for K for each project (the trigger). Once a project is complete, the firm is then allowed to increase its revenue by the associated K increment. The projects are not tied to any particular time schedule (other than the requirement that they are completed within the current control period), thus allowing firms to schedule them as it wishes and, in a sense, to manipulate its revenue accordingly.

Neither the introduction of the K factor in the calculation of the allowed revenue, nor the way in which ENARGAS calculated it in the 1997 price review (in 1992 K was set to zero) have proved controversial in any way.

Source: *The Regulation of Investment in Utilities: Concepts and applications*, Alexander & Harris, 2005

Box 3.3: Use of negative triggers in UK airports

The development of major new capacity at airports is something that requires significant government policy decisions and planning applications. The former are prone to delay, as per the debate about the third runway (R3) at Heathrow, and the latter can face numerous appeals, as was the case with Terminal 5 (T5) at Heathrow.

Initially the CAA, the airport regulator, put in place an asymmetric re-opener to handle the uncertainty with T5 (discussed elsewhere in this report) but this proved far from satisfactory. Consequently at the next review the CAA introduced negative triggers. Although T5 was included in the regulatory asset base and consequently remunerated at the price determination, key input stages of the development of T5 were identified and linked to specific adjustments to revenue – 2% per stage. If the company failed to deliver a stage on time then revenues were reduced until such time as the stage was completed.

It was suggested at the most recent airport determination that a similar approach should be adopted for the Project for the Sustainable Development of Heathrow (PSDH) which encompasses T6 and R3. The final determination for Q5 did not include triggers for these two projects but did include other triggers. However, BAA and the airlines agreed to informally apply triggers to the £600m of proposed investment during Q5 if agreed dates were not met. It is our understanding that the current delay in the government's decision about R3 has meant that the first trigger has been missed and revenues were reduced accordingly.

Source: *Economic Regulation of BAA London Airports 2003-2008: CAA decision*, February 2003 and *Heathrow and Gatwick Airports – CAA decision*, March 2008.

3.4.2. Lessons for Ofgem

Overall it is clear that there are approaches to dealing with both the uncertainty of timing and volume of investments. Ofgem has used some of these options in the past quite

successfully and there are good examples of how others have been used in other industries. Some of these approaches are more appropriate for major capex items and it depends on the type of investments expected and the uncertainty faced as to which approach is likely to be best suited. Of course, there is a cost associated with the majority of these types of approaches inasmuch as risk is transferred from the company to customers and this is manifested in more volatile prices. Ofgem's decision to drop cost drivers from the latest gas distribution price determination can be interpreted in this light. One of the approaches, logging-up, does not lead to volatile prices within the price control period but the corollary of this is that companies might face a financeability problem if too high a materiality threshold is set.

3.5. Contracting-out investment

An approach that has been used in a few cases in the UK and quite significantly in some overseas countries (especially Latin America) is that of contracting out investment – effectively a form of public private partnership (PPP). Once a need for investment has been determined, rather than require the incumbent to undertake the investment and have the whole process of determining an appropriate value etc, the contracting-out approach is used.[28] This involves the incumbent, or some other agency, holding a competitive tender for the provision of the investment.

Various forms of contracting out exist. They include:

- turnkey contracts for the construction of new infrastructure – already used by most utilities to some degree;
- build-own-transfer type contracts where the infrastructure is constructed and then owned by the third party but operation is undertaken by the incumbent; and
- build-own-operate type contracts where the infrastructure is constructed, owned and operated by the third party with operation governed by contractual arrangements.

In the UK the main examples of the final approach to contracting out have been seen in the water industry. In Scotland and Northern Ireland these PPP type arrangements have been used for water treatment and sewage treatment works – discrete investments at either end of the supply chain. In other countries these types of approach have been used to provide more integrated aspects of investment – Latin America has especially used these approaches for the supply of electricity transmission lines.

From a regulatory perspective contracting-out investment offers some advantages and disadvantages. For example, the competition to provide the construction and financing can:

[28] It is also possible to contract out just operations – versions of this are used by Welsh Water and North West Electricity Networks where the asset owner periodically selects an operator through a competitive tender. This approach is also being considered for Terminal 2 at Dublin Airport.

- ensure the cheapest delivery of the project;
- allow alternative tariff profiles to be used, especially important when an asset will be under-utilised for a significant part of its life; and
- allow innovative solutions to problems to be proposed.

However, it also:

- involves an upfront cost in terms of defining and procuring the project;
- may involve sub-optimal choices about the mix of capex and opex (although it ought to be possible to address this through the use of whole-life costs); and
- may limit the ability of the regulator to push for future efficiency savings.

Consequently a contracting out approach may not be appropriate in all cases. There is also a question as to whether a regulator should require contracting-out – the Argentinean electricity transmission example – or just allow companies to use contracting-out when they see it as appropriate – the UK approach to this. However, if the non-mandated approach is used then the regulator can be faced with needing to allow significant freedom with respect to a long-term commitment and the foreclosure of future possible efficiencies while not necessarily gaining all the advantages that the approach embodies.

An alternative approach to this, used by Ofwat for the water and sewerage industry in England and Wales is to require significant market testing of costs and arms length transactions between different parts of a group. While this does not generate all the benefits it can bring about some of them, especially if a credible threat exists for poor implementation of the process – in 2007 Ofwat fined United Utilities £8.5m for failing to apply the rules properly.

4. OVERALL REGIME DESIGN

This section of the report considers some of the broader aspects of the regulatory regime where Ofgem might want to consider alternative approaches or enhancing its existing approaches. Specifically there are three main areas to consider:

- the role of consumers (excluding the aspects linked to determining the need for investment that are handled elsewhere);
- ways in which uncertainty are handled; and
- ways of handling under-utilised assets.

The latter point has not been a major issue for the energy sector owing to having a relatively mature network. However, some of the issues linked to major new investments, such as the off-shore transmission network, may raise these concerns. Further, if an industry were to face long-term decline or sporadic utilisation issues then similar issues could arise.

4.1. The role of consumers

An area that has attracted a lot of attention during the last couple of years is the role that consumers play in the regulatory process. This is increasingly important since perceptions of transparency and good practice require stakeholder involvement and, as discussed in Section 3 above, increasing levels of investment require clearer customer buy-in to the consequential impact on prices.

4.1.1. Areas where customers could be more involved

There are three possible areas where customers could be involved in the regulatory process. They are:

- as part of the general consultation process for any key regulatory decision (through the publication of consultation documents seeking public responses as well as through public meetings etc);
- related to the justification of elements of an investment programme since it is customers that will benefit from the investment and also fund it; and
- as part of the accountability process through some form of right to appeal regulatory decisions.

Examples of some of these are seen in different sectors and discussions about others have occurred.[29] The second aspect of this has been discussed in detail when considering investment issues.

4.1.2. Current arrangements

Consultation

All UK regulators and the vast majority of regulators in other countries operate the first form of consumer involvement through consultation processes. Most UK regulators now combine both the opportunity for written responses along with public sessions – although these tend to be opportunities for the companies and possibly the regulator to explain ideas to customers rather than question and answer sessions or cross-examinations which can be seen in some other jurisdictions, like the US.

The UK also provides a "customer voice" through formal bodies responsible for presenting the views of customers. It is common however for these bodies to be formed from the "great and the good" rather than people selected directly by customers. In addition these approaches can be supplemented:

- Ofgem has introduced for EDPCR5 a panel of 100 customers who are more directly involved in the price determination process than was previously the case; and
- Network Rail, the infrastructure provider in the rail industry, is a company limited by guarantee which has a stakeholder board which includes customer representatives.

Appeals

The final area where customer involvement can be considered is that of appeals.[30] Currently it is the case that only the regulated company can cause an appeal of a price review by refusing to accept a licence modification associated with the new determination.[31] In principle the relevant Secretary of State could cause something similar since they have the right to block a licence modification on behalf of customers. This need not lead to an appeal – in principle the regulator and company could propose an alternative determination without going to appeal – but has never been tested since no Secretary of State has so objected. It should be noted that in the UK communications is different to the other sectors since customers do have the right of appeal.

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[29] For example, the head of the Competition Commission raised the fact that no price determination appeal had occurred in the energy sector since the late 1990s. This could mean that regulation is successfully doing the job that is required or that regulatory capture has occurred.

[30] We are primarily focused with appeals of substance in this section rather than appeals of process.

[31] Technically it is the regulator that appeals the refusal of the company to accept the determination to the Competition Commission rather than the company appealing directly to the Competition Commission.

Airport regulation in the UK is, however, quite different in terms of the process that is followed. Rather than the regulator undertaking a price review and the company having the right to appeal the process for airports is:

- the regulator commences a review and determines the need for regulation and the key issues to be addressed;
- this is then referred to the Competition Commission which undertakes a review;
- the Competition Commission then reports to the regulator; and
- the regulator then makes a final determination.[32]

Major users of the airports have always been heavily involved in the Competition Commission element of the review. However, they only have the right to judicial review of the final determination (also true for the airport owner) – something that is currently underway for the 2008 Gatwick determination.

As part of the consultation underway for the review of airport regulation it has been proposed to shift airports to the same process as other regulated industries with the Competition Commission becoming the appeal body. It has been accepted by several of the stakeholders that the existing situation gives significant rights to the airlines that they could lose under the standard regulatory model. Consequently the regulator suggested that it may be appropriate to give the airlines a right of appeal, something that British Airways and other airlines have strongly advocated.[33]

In other countries the right of appeal is not limited to the regulated company. For example, in Ireland customers also have the right to appeal regulatory decisions. This has been taken to extremes in the airport sector where one airline has appealed a significant number of regulatory decisions – especially relating to price reviews. See for example the January 2009 consultation paper released by the Commission for Aviation Regulation on the findings of the Appeal Panel related to the interim determination undertaken with respect to terminal 2.[34]

The Irish experience demonstrates that an unfettered right to appeal may not be appropriate. However, designing appropriate checks and balances so that customers gain a realistic right to appeal without unduly burdening the regulatory process ought to be achievable. Other examples, such as the Essential Services Commission in Victoria (Australia), the regulator for one of the Australian case studies, seem to be less prone to the problems identified above.

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[32] The regulator is not bound to accept the Competition Commission's views on each element of the determination or the overall determination. This is different to other regulators who are bound to accept the results of an appeal – this was introduced for the regulators commencing with Ofgem in the Utilities Act (2000).

[33] See for example: CAA's response to DfT's September 2008 request for views, section 52, published in November 2008 on the CAA website.

[34] Consultation on the decisions of the 2008 Aviation Appeal Panel.

4.1.3. An alternative role for consumers

An approach that has been used in some states in the US places a much greater emphasis on consumers since they are empowered to negotiate their own deals with the utility companies – sometimes with the support of "intervenors". Box 4.1 provides an overview of the classic example of these negotiated deals in Florida.

What is clear is that for large consumers the ability to negotiate a deal can lead to a favourable outcome. What is less clear is whether residential consumers can benefit in the same way. However, it may be that the alternative institutional arrangements – especially the role of the consumer advocate or Office of the Public Counsel (OPC) – acquires much greater significance when considering residential users.

In some respects, especially for large users, it may be that negotiated settlements are a natural extension of the constructive engagement type approach already being used in airports. However, the need for alternative institutional arrangements and the ability to expand the benefits to residential users would need to be investigated further if this approach were to be developed in the UK.

4.1.4. Lessons for Ofgem

What is clear is that although Ofgem has probably gone further than many of the UK regulators with respect to some aspects of the role for consumers, there are areas where other regulators in the UK and overseas have gone further. Specifically in other regimes consumers have a greater role with respect to:

- justifying investment either through willingness-to-pay surveying or constructive engagement;
- a possible role in appeals; and
- negotiated settlements.

The applicability of some or all these approaches to the various elements of the British energy businesses would need to be assessed before they could be employed – but it is clear from the examples that it is possible to allow consumers a greater role in the regulatory process.

There may also be some trade-offs that should be considered. For example, if consumers are given effective voice during the price determination process would they still need the right of appeal? It could be argued that appeal for issues of substance (rather than process which would still be covered by judicial review) are less important if an effective voice is given to consumers during the determination. This is likely to be an issue that is investigated in further detail in at least one of the reviews identified in Section 1 that are underway.

Box 4.1: The use of stipulation settlements in electricity regulation in Florida

Since the mid-1980s, regulation of electricity prices in Florida has increasingly been determined by stipulated settlement between a utility and a particular consumer group, thus moving away from the prior approach of litigation. Littlechild (2007) shows that, in the ten years to 1985, electricity prices were determined through litigation in all 20 cases that involved Florida's four major electricity companies. In the following ten-year period, 17 out of the 20 cases that occurred were settled through litigation, with the remaining three being settled by stipulation. Over the ten years to 2005, however, nine out of the 10 cases which occurred were settled by stipulation, with only one being settled through litigation.

Under the litigation system, Florida state's regulatory body, the Florida Public Service Commission (FPSC), would open a case either based on its own determination or following a request by either the utility itself or by a body representing consumers. Following an investigation/hearing, the FPSC would make its decision, which held the same status as that pronounced for a court of law. Stipulation settlements have been facilitated by the Office of Public Council (OPC), which is a body set up in 1974 to represent the citizens of Florida in matters involving utilities. Stipulations must also be approved by the FPSC.

Stipulations have resulted in an array of measures to lower prices faced by consumers, such as price reductions, price freezes and refunds, while never resulting in a price increase. Littlechild (2007) calculates the savings to consumers that resulted for stipulated settlements during the period 1986-2006 at over UD$3 billion and notes that all of these benefits were either greater or occurred earlier than had those settled through litigation. Indeed, Littlechild argues that around 75 per cent of the reductions would not have occurred at all had the case been settled by the FPSC alone.

It is important to note, however, that the catalyst for the increased reliance of stipulated settlements is not the fact that they provide the same outcome at a lower cost, but rather that they allow for a different outcome than would have been the case under litigation, and that is the main reason the utility companies agreed to the above reductions. Stipulations on occasion included clauses that specified a period for which further price reductions could not be requested, or included a provision for the withdrawal of a separate claim against the utility.

Stipulations also resulted in a shift of the regulatory method itself, with a move away from the classic "building blocks" approach in which an allowed return on equity (ROE) was used in order to determine prices and towards a system in which the ROE had little role, although deviations from a particular ROE were occasionally used as re-openers. Furthermore, the increased use of stipulated settlements saw a move away from the FPSC's favoured earnings sharing schemes toward revenue sharing, which it was claimed was easier to enforce and which removed utility companies' incentive to artificially increase their costs in order to drive down earnings. The risk that the above shift it the regulatory approach would encourage cost-cutting by the utility were, in some settlements, countered by the introduction of service standard controls.

The main concern with regard to stipulated settlements which were facilitated by the OPC is the fact that large industrial users are likely to benefit from them more than residential consumers. However, Littlechild (2007) suggests that smaller electricity users were also better off as long as the stipulation resulted in an overall reduction in prices of more than 10 per cent, which he argues was indeed the case. Overall, the use of stipulations is seen to have brought about a more flexible approach to utility regulation.

Sources: Littlechild, S. (2007) 'The bird in hand: stipulated settlements and electricity regulation in Florida', Electricity Policy Research Group Working Papers, No.EPRG 0705.

Littlechild, S. (2006) 'Stipulations, the Consumer Advocate and utility regulation in Florida', Electricity Policy Research Group Working Papers, No.EPRG 0615.

4.2. Price control re-openers and other approaches to dealing with uncertainty

4.2.1. Current arrangements

Most price controls for network utilities in the UK and elsewhere include some form of mechanism to re-open the price control. In general (although not always), re-opening provisions are asymmetric, in that they are intended to address circumstances in which the regulated company incurs significant additional and unexpected costs, rather than to address situations where the regulated company incurs significantly lower costs than expected. Incurring lower costs is the inherent incentive in RPI-X regulation.

Although every mechanism is different, we consider that it is possible to broadly classify re-opening mechanisms into three categories:

- **General ship-wreck clause** – The price control can be re-opened if the company is in material financial difficulties due to events that are beyond its reasonable control. The company may be required to demonstrate that it has done everything reasonably possible to mitigate the adverse financial position. Postcomm and ORR are examples of regulators that use this approach in the UK. The electricity price control in Mississippi is another example of this approach.
- **Interim review part way through the price control** – The regulator allows the company to request a review of some or all aspects of the price control after a number of years of the control. This may reflect that there is particular uncertainty about the costs of certain items over the whole period of the price control. The airports sector in the UK allows an interim review of price caps. The regulation of gas and electricity in New York state also has a form of this approach.
- **Pre-specified events or triggers** – The regulator specifies, when the price control is set, the cost items for which it will consider re-opening the price control if these costs vary significantly from the allowance, with the amount of variance often specified. Items that are included in these mechanisms are generally considered to be somewhat beyond the direct control of the regulated company. Ofgem and Ofwat use this approach extensively in the UK. The electricity price control in Mississippi also includes elements of this approach.

These three general approaches are not mutually exclusive, and are sometimes applied in combination – for example, Ofwat uses both pre-specified events and a general ship-wreck clause for the England & Wales water sector.

We also discuss below the use of pass-through or partial pass-throughs as another means to address uncertainty.

4.2.2. Potential lessons for Ofgem to learn

From our review of other sectors in the UK and examples in other countries it is clear that there is no "standard" approach to considering the re-opener issue, and furthermore, there is no clear evidence of an emerging consensus about the best approach to adopt. Therefore, as regards the lessons for Ofgem from other approaches it is probably primarily consideration of their relative advantages and disadvantages compared to Ofgem's current approach. Such an evaluation will also need to consider whether the nature of the re-opening mechanism that is considered depends on other aspects of the price control, e.g. the use of whole or partial pass-throughs.

Use of ship-wreck clauses

Postcomm's approach to the general ship-wreck clause is perhaps the "purest" attempt to implement RPI-X regulation in the UK, in the sense of making the company responsible for financial under performance so far as reasonably possible. Box 4.2 below explains this approach.

Box 4.2: Postcomm's re-opener in Royal Mail's price control

Royal Mail can only request a re-opening of the level of its price control if it is able to demonstrate to Postcomm that there has been a fundamental change of circumstances outside of its control, which affects its economic performance to a significant extent, any other significant risk to meeting its universal service or other licence obligations. If it satisfies Postcomm with regard to these conditions it then has to demonstrate that it is an efficient operator or is taking all reasonable steps to become an efficient operator. This mechanism has not been tested by Royal Mail, but appears to represent a very material hurdle to overcome to secure a re-opening of the price control. Therefore, at least initially this suggests that Royal Mail is exposed to significant downside risks on its price control. The caveat to this conclusion is that the price control includes specific mechanisms that partially protect Royal Mail against volume and pension cost risk. Furthermore, as a state owned company it has access to some financial facilities provided by the Government. Finally, specific provision was made such that after two years certain aspects, related to the structure rather than level of price control could be reviewed. It was these specific provisions that Royal Mail used to request the recent interim review.
Source*: 2006 Royal Mail price and service quality review: Final Proposals,* Postcomm, December 2005

The potential advantage of Postcomm's approach is that it is clear in advance to the company and customers that the responsibility for managing all the risks under the price control lies initially and strongly with the company. Only where events occur that are primarily beyond the company's control and if it is doing everything it can to be efficient, will it be able to secure some financial relief. Perhaps the principal disadvantages are the uncertainty about when and in what circumstances the mechanism would apply, and a concern that the company is being asked to manage some risks that are largely beyond its control, which could lead to a higher cost of capital than would otherwise be required –

possibly acceptable in post where investment is relatively light when compared to energy. This approach would represent a significant departure from Ofgem's current approach.

It is not clear to us that Ofgem would be likely to find interim price control reviews an attractive approach for network companies. It would blunt incentives for efficiency because gains may be kept for shorter periods of time, and it would increase the regulatory burden for all parties.

Use of specified events or triggers

Although this approach is already used by Ofgem, there are various forms of this approach, and alternative approaches could have some merit for Ofgem to consider.

The approach used in New York state for gas and electricity provides an interesting alternative approach that is based on analysis of overall returns rather than specified cost items or events. In New York the approach is used to prevent "excess returns" being earned, but it could in theory be used to identify when a company was in financial difficulties. The potential advantage of such an approach is that the price control would only be re-opened if the company was in overall financial difficulties, so if one cost item was significantly higher than planned, but this was offset by lower costs for other items there would not be a re-opener. In contrast re-opening for specific cost items can lead to companies receiving additional revenue even when they are out performing the overall price control. There are a number of potential disadvantages, including measurement issues, potential perverse incentives for companies to trigger or avoid triggering the re-opener, and companies' bearing some risks that are largely outside their control within the parameters of the triggers for re-opening. Nevertheless, this approach could be complementary to Ofgem's attempts to measure DNO's actual equity returns for EDPCR5.

Another alternative approach to re-openers has been the use of triggers by the CAA relating to the large investment in Terminal 5 by BAA. This case study below shows some of the risks associated with an asymmetric trigger for price control re-opening.

Box 4.3: Asymmetric trigger for Heathrow airport Terminal 5

Perhaps more than other regulated sectors, airport investments are heavily affected by environmental and planning consents. This can lead to significant delays to completing projects. Delays to the development of Heathrow Terminal 5 are a good example of this.

During the third quinquennium (ending March 2003), BAA had an asymmetric interim determination clause relating to possible delays to the consent and construction of Terminal 5. Rather than utilize this option (which was only open to the company), BAA made voluntary price reductions in the second half of the price control period. It was not clear that this provided a full rebate to the pre-payment revenues received during the third quinquennium. The Competition Commission considered whether some ex post revenue clawback should occur, despite its concerns that this would undermine the incentive properties of RPI-X regulation.

Recognising this approach had not worked, the CAA and Competition Commission developed milestone linked negative triggers for Terminal 5 for the fourth quinquennium.

Source: *The Regulation of Investment in Utilities: Concepts and applications*, Alexander & Harris, 2005

4.2.3. Pass-through

Many price controls also contain provisions that allow full or partial pass-through of costs that are considered to be wholly or largely beyond the control of the regulated companies. These arrangements are different from the re-opening provisions discussed above because they are automatic adjustments that do not require any further action or judgement by the regulator. Ofgem uses re-openers for costs such as business rates and licence fees. ORR has a pass-through for traction electricity costs. However, Ofwat and Postcomm do not have any pass-through mechanisms, so there is a lack of consensus amongst UK regulators about the best approach.

From the examples we have reviewed in other countries there is also a mixture of approaches, but there seems to be a general reluctance to provide companies with full pass-throughs. The Irish energy regulator has moved to a regime based on partial pass-throughs for a number of cost items, including business rates, which recognises that the company may have some ability at the margin to influence these costs. The French energy regulator's latest gas transmission price controls include a combination of full and partial pass-throughs.

There is no clear consensus from the examples we have reviewed about when and how to use pass-throughs. There is some evidence of an increasing trend to move away from full pass-throughs, which appears to recognise that very few costs are wholly beyond the influence of the regulated company.

4.2.4. Lessons for Ofgem

There is no consensus about the most appropriate approach to using re-openers in price controls either within the UK or elsewhere. We have identified three broad categories of approaches – general ship-wreck clauses, interim reviews and specified events or triggers. Examples of all these approaches can be found in the UK and elsewhere. It is difficult to obviously understand why regulators have preferred different approaches to re-openers when faced with not clearly dissimilar circumstances. It appears reasonable to conclude that it is probably a function of policy-makers preferences at the time and previous precedent in that sector, rather than strong theoretical or empirical reasons.

There is perhaps some evidence in the UK that regulators tend to move from general ship-wreck clauses towards specified events and triggers. Ofwat and Ofgem, which have been established longer use specified events approaches, while Postcomm and ORR use general ship-wreck clauses. Specified events approaches can be seen as effective in providing certainty and limiting risk protection for companies to items that are clearly assessed as being largely outside their control. The potential downside is that the re-openers are quite likely to be triggered, thereby increasing price uncertainty and volatility, and companies might obtain additional revenue even when their overall financial performance is strong. General ship-wreck clauses are less likely to be triggered and provide an arguably clear articulation of the principle that companies must manage risks within the RPI-X framework, apart from the

occurrence of exceptional events leading to very adverse financial outcomes. The downside is that cost of capital may be higher than otherwise because of greater risk to companies and there is more uncertainty about precisely when the re-opener will be used.

4.3. Under-utilised assets

A final set of issues that many regulators have had to consider is concerned with the way that the regime handles under-utilised assets. This issue arises when optimal capacity additions lead to significantly greater capacity than that needed in the short- to medium-term. Given the natural monopoly aspect of network industries it is often the case that capacity additions are not easily divisible or that the cost implications of making a small capacity addition are inefficient when compared to a larger incremental addition.

The issue of under-utilised assets is clearly linked to the issue of financeability which is discussed in Section 5 since excess capacity (or the costs incurred when building new capacity prior to it becoming operational) is one of the most likely causes of financeability problems.

Of course, the problem discussed here is not only linked to new assets. Existing assets may be subject to periods of under-utilisation. For example, CER (the Irish energy regulator) has recently considered the implications of variable utilisation of the second gas interconnector with Britain.

4.3.1. Current arrangements

Most regulatory regimes, especially in the UK and Ireland have at their heart the concept that costs incurred within a price control period will be recovered within that period. While this approach to revenue determination and price setting may be at odds with the way in which a competitive market would set prices it has been adopted by regulators because it:

- meets the financing the functions requirement;
- is appropriate when assets are close to being fully utilised in a mature network; and
- solves the problems inherent with regulatory credibility if costs are pushed out to future price control periods.

However, while this basic tenet holds there are still circumstances where either a deviation from the standard approach occurs or even the standard approach is insufficient to meet financeability requirements.

As noted in the introduction, one of the major issues facing some regulators is the problem faced with wanting to cover costs while accepting that short- to medium-term utilisation of a core set of assets may be relatively low. This is perceived to be a problem owing to:

- notions of inter-temporal equity – existing consumers are being asked to pay for services that they are not consuming and consequently future consumers are being subsidised;
- limited inter-modal competition may exist such that the under-utilisation of one form of service pushes the price to a point that customers either reduce their overall demand (so creating a vicious circle of rising prices and falling demand) or switch to imperfect substitutes – this may be an issue in both the energy and transport sectors; and
- knock-on effects on down-stream users. If the service is a key input to other price or socially sensitive services, such as gas generation of electricity, then high prices in the input sector may have unacceptable consequences downstream.

Some regulators when faced with this problem have considered ways in which costs can be re-profiled so that a more acceptable price level is found in the short- to medium-term. These approaches have mostly focused on re-profiling depreciation to back-end load costs. Examples of this include:

- Irish gas transmission regulation where 50 year assets (the Pipeline to the West and the second Great Britain interconnector) have initially been depreciated over a 100 year life so that initial costs are low;[35] and
- airport regulation in Ireland and Holland have both allowed depreciation to be set on a unit of production basis – this takes the expected use of the asset over the whole life and allocates depreciation evenly to each unit of service.[36] If utilisation is back-end loaded then annual depreciation will also be.

Other approaches have been discussed in some of these examples. For instance, CER recently consulted on issues linked to low and volatile utilisation of the second gas interconnector as part of the Common Arrangements for Gas Transmission Tariff Methodology consultation jointly undertaken with the Northern Ireland Utility Regulator (NIAUR). In this case some of the other approaches under consideration include:

- writing-off some of the asset value;
- transferring some of the asset value to an asset with less price sensitive demand such as the onshore transmission network (effectively a form of Ramsey pricing);

[35] This issue was discussed in the 2007 determination, CER07110. The Pipeline to the West was switched at the last review to a 50 year life while the second interconnector was left on a 100 year life owing to expected utilisation remaining low when the new Corrib field comes onstream.

[36] The Irish Aviation decision on a unit of production basis is in relation to the second terminal at Dublin Airport and the associated utilisation problems that arise. This was covered in the 2007 interim determination that arose from the submission of updated and significantly higher costs for the second terminal project.

- a levy on all gas to reflect the security of supply provided by having the second interconnector available; and
- requiring all gas shippers to book a minimum level of capacity on the interconnector (effectively another security of supply requirement).

While this consultation continues it appears likely that if the revenue smoothing implicit in the re-profiling of depreciation is insufficient then some of the asset value will be shifted to the on-shore system. How the need to shift costs and how the level of cost to be shifted would be determined have not been stated.

Finally, an alternative approach that has been used when networks are being developed is to require users to contribute all or some of the cost as a capital contribution. Connection charging in most UK regulated sectors incorporates elements of this – either directly as a contribution or as a guarantee such that the network company is able to borrow the money if necessary. Of course, the shallow pricing approach used by Ofgem does not defray much of the capital cost through contributions but deep pricing would. Australian electricity transmission networks were developed this way and, in principle, this approach could still be considered for off-shore networks or reinforcement of onshore networks (although this would exacerbate the problem facing the renewable generators of very high-upfront costs).

4.3.2. Lessons for Ofgem

What is clear is that there is no single accepted approach to handling under-utilised assets. While this is an issue that Ofgem has not had to address in the recent past it may need to address these issues in the future – especially in relation to the development of a new off-shore electricity transmission grid for renewable generation or if demand patterns change radically so stranding existing assets. Whether some of the other approaches are more suited to the future situation that Ofgem is going to face depends on the drivers of the issue and the ability of consumers to accept costs.

5. FINANCIAL ISSUES

In Section 2 we provided an overview of the basic approaches to estimate the cost of capital adopted by the various regulators. In addition to the approach to cost of capital, when thinking about financial issues it is useful to consider:

- **Treatment of specific elements of the cost of capital,** such as inflation and taxes, and their impact on the profile of required revenues and prices; the time horizon over which the calculation is made and the basis of estimating the risk-free rate;
- **Treatment of embedded debt**; [37] and
- **Financeability issues.**

Each of these are addressed in this section, and the approaches adopted by the various regulators to this regard are summarised in table 5.1 below. Given the number of appeals to the Competition Commission that have occurred it is unsurprising that there is a fairly high degree of commonality of approach in the UK. However, there are some differences and these are highlighted in the summaries below.

[37] This is debt borrowed in previous price control periods and which may have a higher or lower cost than the cost of debt allowed for the current price control period.

Table 5.1: Treatment of specific elements of the cost of capital

Country	Sector	Year	Risk-free rate		Embedded debt
			Approach	**Source**	
UK	Airports	2008	Estimate of combined cost of debt and separate estimate of risk free rate as cost of equity component	Real risk free rate (for cost of equity): five and 10 year maturity index-linked gilts and forward rates Cost of debt: five and 10 year maturity of UK utility companies funding costs	Conclusion was that airports have possibility to secure less expensive debt.
UK	Water	2004	Criteria not fully discussed	Real risk free rate: yields on medium term index-linked gilts	Conclusion was that the allowed cost of debt was being set towards the high-end of the range weakened the embedded debt problem. Analysis of each embedded debt premium proposed by the companies. In one case it was deemed as reasonable in principle but that the cost of debt allowed provided enough headroom.
UK	Rail	2007	Mix of cost of funding over the last five and 10 years and current cost of funding	Real risk free rate: 10, 20 and 30 year maturity index-linked gilts – both spot rates and five and 10 year averages. Deflated nominal rates as well	Cross check with existing cost of debt. Effectively weighted average of existing and forward looking cost of debt.
UK	Telecoms	2005	A maturity relevant to the duration of the control period but taking into account that BT is required to make investments with a long economic life	Nominal risk free rate: Government bond yields with five years to maturity	n.a.
UK	Post	2005	Overview of other sector regulatory decisions in the UK	Real risk free rate: as proposed by Royal Mail	n.a.
New Zealand	Gas	2008	Matching the length of the regulatory period (five years) to ensure NPV=0 principle	Nominal risk free rate: seven year bonds averaged over July 2005	n.a.
Australia (NSW)	Water	2008	Matching the length of the life of the asset	Nominal risk free rate: 20 day average yield on 10 year Commonwealth Government bond rate index	n.a.

Country	Sector	Year	Risk-free rate		Embedded debt
			Approach	Source	
				Real risk free rate: 20 day average yield on inflation indexed Commonwealth Government bonds (with closest maturity to 10 years)	
US	Electricity	2001	To match equity investors planning horizon and to avoid short-term fluctuations that should not have any impact on equity return	Nominal risk free rate: yield on 10 year Government bonds with adjustment for spread difference between 10 and 30 years	n.a.
Italy	Gas	2008	Not provided	Nominal risk free rate: one year average of yields on 10 year maturity Government bond Real risk free rate: used Fisher equation on nominal rate, using a four year inflation projection	n.a.
Holland	Gas and electricity distribution	2005	Medium-term maturities more representative of the financing behaviour of companies	Nominal risk free rate: two and five year average of 10 year maturity Dutch Government bond Real risk free rate: used Fisher equation on nominal rate, using a two year inflation projection	n.a.

5.1. Treatment of elements of the cost of capital

5.1.1. Time horizon

In principle when choosing the funding for an asset a company will try to match the duration of the asset with the liability – so for very long-lived assets like those in infrastructure networks one would expect long maturity liabilities. However, when it comes to estimating the allowed rate of return regulators are often faced with the problem of not having reliable data about long-lived liabilities. This may be due to the lack of instruments that have the requisite life or the market for such instruments being illiquid and consequently any information being of questionable value.

As such regulators have tended to focus on shorter maturity liabilities/instruments when estimating the allowed rate of return.[38] However, as Table 5.1 illustrates, there is no single approach when the risk-free rate is considered. Even within the UK there is a significant range of different maturities or mixes of maturities considered.

5.1.2. Estimating the real risk-free rate

As noted earlier, there is no real consistency in the way that an inflation adjustment is made. This is partly because different countries have access to different types of instrument – in the UK, Australia, US and some continental European countries Governments have issued index-linked bonds which remove the majority of inflation risk.

In the UK and Australia estimates of yields to maturity from index-linked bonds have traditionally been the approach adopted to estimating the real risk-free rate. In the UK this has recently been questioned owing to the impact of the credit crunch and the corresponding flight to quality which has made the yield on index-linked government securities both more volatile and until recently much lower than other approaches to estimating a real risk-free rate would yield. WaterUK's cost of capital paper prepared as part of the PR09 process discusses these issues and the alternative approaches in detail.

Australian regulators are also reviewing the approach since the Commonwealth Government has stopped issuing index-linked bonds. IPART, the state regulator for New South Wales, has recently issued a consultation paper on alternative approaches that could be employed to determine the appropriate real risk-free rate.[39]

One of the alternative approaches that many regulators use is to adjust a nominal risk-free rate for an estimate of inflation. The problem is the determination of the most appropriate

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[38] In principle the use of a shorter maturity should not matter if the regulator is consistent. However, as the recent volatility in UK markets has shown, shorter-maturity bonds tend to be more volatile than long-dated ones and consequently this might produce greater swings in the estimate of the risk-free rate with subsequent implications for investment incentives and financeability.

[39] *Adjusting for expected inflation in deriving the cost of capital*, IPART, February 2009.

estimate of inflation – as Table 5.1 shows there is no clear agreement on the time horizon of the estimate of inflation. There is also the question of whether it is a market estimate of inflation, say derived by surveying market participants, or the Government head-line projected rate of inflation. Both approaches to estimating inflation suffer from problems.

5.2. The embedded debt issue

For the purpose of this paper, and in the context of setting the allowed cost of debt, we refer to the "embedded debt issue" as the issue related to the treatment of existing debt negotiated at any interest rate different from a floating interest rate and that may result in a cost of debt either higher or lower than the allowed cost of debt.

Key remarks:

- **The embedded debt issue can be analyzed in two dimensions:**
  - Existing embedded debt: which is a relevant issue only when a significant component of future debt over the price control period is represented by existing non- negotiable fixed debt; and
  - Risk of creating additional embedded debt in the future: which may arise when interest rates are increasing and new debt is negotiated.

When setting the allowed cost of debt, regulators take into accounts the following aspects:

  - Managing the risk for regulated companies of financeability issues on their existing embedded debt; and
  - Setting proper incentives for companies to limit/avoid the risk of creating new embedded debt in the future; thus providing incentives for companies to negotiate and renegotiate their debt at the lowest available interest rates.

- **Market conditions influence the magnitude of the embedded debt issue:** should interest rates vary around a steady average, a company's non-floating interest bearing debt does not generate an embedded debt issue. The embedded debt is particularly relevant in the context of significant shifts of spot interest rates that lead to changes to the average interest rates over time. For example, on one side, should the allowed cost of debt reflect lower average interest rates, companies might not be able to recover the total cost of their "old" embedded debt. On the other side, should average interest rate increase over time, the new debt acquired by companies might cause an embedded debt problem in the future, if debt is negotiated at a higher cost than the allowed cost of debt. How changes of the average cost of debt impact on the embedded debt issue depends on the treatment of embedded debt and on the approach in setting the allowed cost of debt.

- **The product offering from the market and the opportunity for companies to refinance their existing debt are relevant.** A notional cost of debt takes into accounts

also the opportunity that companies have, or had in the past, to renegotiate their debt. This opportunity is dependent upon:

- Product offering from the market. For example, in the past, regulated companies had the capacity (relating to gearing and credit rating) to issue index- linked debt and they have been doing so at extremely keen rates.
- Each company's access to a lower cost of debt than they are currently paying and the incentives companies receive to renegotiate their debt.[40]

5.2.1. Approaches to embedded debt issue

We have indentified the following approaches to deal with the "embedded debt issue" and these are summarized below.

- **Split cost of capital.** This approach involves explicitly taking account of differences in the embedded cost of debt and the cost of debt expected to prevail in the forthcoming control period. This might be thought of as a split cost of debt:
  - with one rate for the sunk capital invested - reflecting the past cost of debt that an efficiently financed business might be expected to have; and
  - another rate for new capital investment reflecting the marginal cost of debt.

  Assets financed over the past decade (now included in the RAB) were funded at a time when real interest rates were historically very low. There is a reasonable expectation that a notional efficiently financed company would have locked in those lower rates by raising a proportion of fixed-rate debt during previous price control periods.

  If the marginal cost of funding new capital expenditure over the next price control period were expected to increase, the issue is whether it would be appropriate to set the cost of debt only with reference to the marginal cost of debt. If this were done, then capital gains would accrue to the utility companies and their shareholders as a result of locking-in the spread between the historic cost of debt and the higher marginal cost of debt. Consequently, regulators may revisit the question of whether to set a single average cost of capital at a level sufficient to enable businesses to fund their capital programmes.

  On the other side, if the judgment is that the actual cost of debt in future is likely to be lower than the cost of embedded debt, then regulators may split the cost of capital to manage financeabilty issues for regulated companies.[41]

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[40] The level of index linked debt that can be accessed by a regulated company is related to its gearing particularly. This is because as the level of gearing increases banks may require the company to cash collateralise a proportion of the inflation linked bullet repayment / refinancing risk.

[41] PR09, Ofwat's determination in 1999 is effectively an example of this approach since a premium for embedded debt was allowed.

- **Weighted average of cost of debt.** This approach consists of setting one cost of debt and applying it to debt, embedded or not. This approach takes into account the composition of the forward looking debt and sets a weighted average cost of debt that reflects the mix of embedded and future debt. This approach can be more or less explicitly formalised in regulatory decisions. It usually involves company specific considerations, thus it can deliver different cost of debt to different regulated businesses.
- **Headroom in setting the allowed cost of debt.** This approach consists of setting the allowed cost of debt on the basis of the expected interest rates but allowing for some headroom which will protect companies from financeability issues which may arise also from the embedded debt issue. In practice, this approach is similar to the weighted average cost of debt approach, but unlike the previous one, it does not involve a precise estimate of a weighted average cost of debt for the sector or for each regulated company.

  Setting the allowed WACC above the actual WACC for a notional efficient company has two main impacts:

  - it generates higher returns for efficiently financed network companies; and
  - it enables those network companies to charge users an 'insurance premium' for the assumed benefit of reduced volatility.
- **Indexation.** This consists of linking the allowed cost of debt, or one of its components, to the market. Introducing a cost of debt adjustment mechanism on incremental notional efficient debt for a coming control period would allow the regulator to set both the *ex ante* allowed cost of debt for that incremental debt and the allowed cost of debt for notional efficient embedded debt closer to the actual cost of debt, thus removing much of the "headroom".

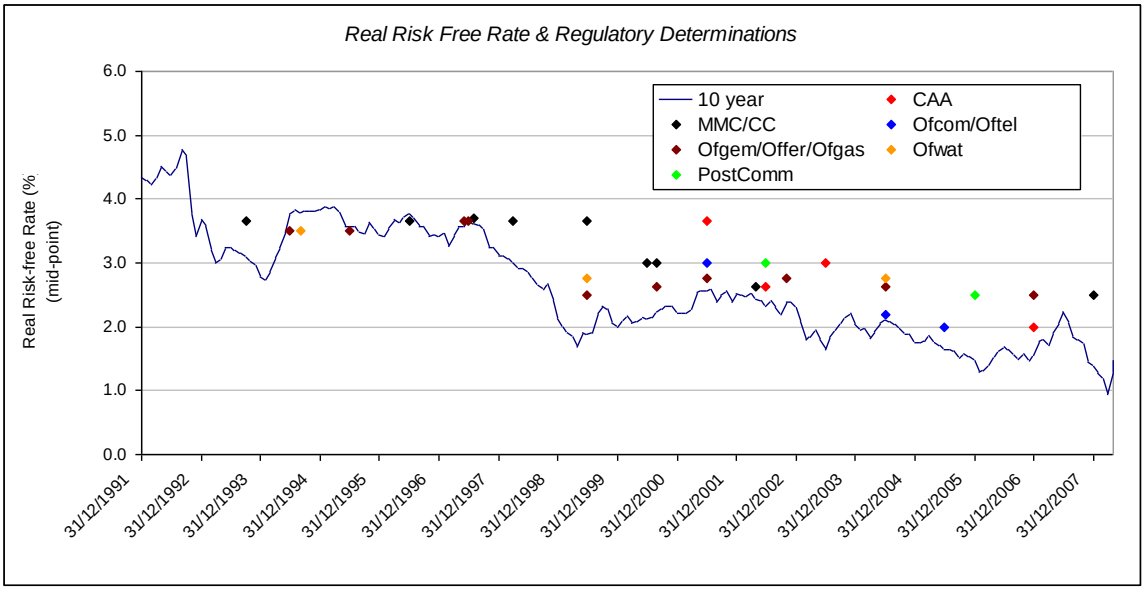
  This approach may allow regulators to decrease or even eliminate any headroom allowed for that portion of existing debt that is deemed as renegotiable. However it does not help resolve the embedded debt issue entirely, if it arises from the cost of debt not being linked to the market and from the companies not being in a position to renegotiate it.

5.2.2. Approaches adopted by regulators

From our review of other sectors in the UK and examples in other countries it is clear that in the past, regulators have mainly responded to uncertainty about the weighted average cost of capital, by including the risk of embedded debt and allowing "headroom" above the observed current cost of capital when setting the allowed cost of capital for the next price control period.

This headroom over the risk free rate is illustrated in Figure 5.1 below.

Figure 5.1: Benchmark risk free rate compared with UK authority decisions[42]



Source: Bloomberg, BoE

In our review we found a few examples of other approaches, namely:

- In its 1999 price review determination Ofwat included an embedded debt premium for the allowed cost of capital; and
- ORR sets a weighted average cost of capital for Network Rail, and checks with the actual cost of embedded debt

These two above examples are briefly set out in the two boxes below.

[42] Regulatory determinations taken from the regulatory proposals of the respective regulators.

Box 5.1: Ofwat - treatment of embedded debt

In its 1999 price control review, Ofwat recognised an adjustment to the cost of capital to take account of companies' continuing costs of existing fixed-rate debt which could not be refinanced except at equivalent cost.

According to Ofwat, this adjustment was made to take into account:

- A change in the1999 methodology from the glidepath of returns on existing assets set in 1994; and
- the downward trend in real interest rates, given that Ofwat placed emphasis on current market evidence of the cost of capital rather than on longer term historical averages.

Ofwat estimated the embedded premium based on the industry average cost of fixed rate debt (approximately 7.9% in nominal terms) and the actual value of fixed rate debt on each company's balance sheet. The embedded debt premium was estimated to range between 0% and 0.4% and it was not applied to assets acquired after 2000.

In 2005 price reviews determinations, Ofwat reviewed its approach and argued the following:

- an efficiently financed managed company is one which manages its financial affairs so as to maintain the necessary flexibility to respond to changing levels of costs, including financing costs;
- there cannot be any automatic cost pass through to customers. If companies retain the flexibility to respond to changing market conditions and have a balanced debt portfolio, embedded debt should not be an issue.
- The "step change" in real interest rates seen before 1999 was dealt with in the previous price control period and does not need to be continued.

In 2005 Ofwat changed its approach to the embedded debt and stated that the allowed cost of debt should be sufficient for a company with an efficient debt portfolio. Embedded debt premium was kept only as an allowance in exceptional circumstances. Companies would have to demonstrate why such debt was part of an efficient financing structure with broadly stable real interest costs and show that they had explored all options available to them for refinancing any high-cost fixed rate debt still in their balance sheets at the time of he 2004 review.

Source: Ofwat 1999 and 2004 price review determinations

Box 5.2: ORR – setting of weighted cost of capital for Network Rail

In 2007, ORR's approach, as suggested by CEPA, to estimating a range for the pre-tax cost of debt has taken into account the mix of existing and future debt and a weighted average cost of debt has been determined.

Key steps of the cost of debt include those listed below:

- Discuss how an efficiently operated notional network rail company might be expected to finance itself in terms of debt maturities, the mix of nominal and index-linked fixed debt and the use of hedging.
- Review the available evidence on the risk free rate, debt premia and the 'all in costs' of debt – looking at spot rates, medium and longer-term averages.
- Identify ranges for the cost of debt of a notional network rail. And
- Cross check these against the likely evolution of Network Rail's actual cost of debt, including embedded debt.

Source: CEPA 2008 report - Risk adjusted cost of capital for Network Rail -

5.3. Financeability issues

Regulators in the UK and in many other countries are required to ensure that a company is able to finance its functions.

While one of the causes of a financeability problem can be under-utilisation of assets, as set out earlier in this report, the normal response is one in which revenues are brought forward rather than costs being pushed back. Regulators have adopted, or discussed, various ways of doing this, including:

- accelerated depreciation (used by Ofgem for electricity distribution, the CAA for airports and the Central Electricity Regulatory Commission in India for electricity transmission and generation);
- cost of capital adjustments (used by Ofwat in PR04) to increase the allowed return on existing assets;
- inclusion of assets in the course of construction (AICC) in the RAB – this can be important for assets that have a long construction period (such as reservoirs or airport terminals) since they start to be remunerated prior to coming into operation;
- pre-payment or revenue advancement – this is when prices are set higher than costs but those additional revenues are treated as an advance payment of future revenues. UK airports use a version of this and it was discussed extensively in the England & Wales water sector by Ofwat in the 1990s; and
- the creation of a regulatory asset – this approach, used extensively in the US, is more of a solution to financeability problems arising from stranded assets rather than low utilisation per se.

Three of these approaches are potentially NPV neutral but that depends on the way in which the approach is implemented and the accounting treatment of the associated cash-flows. A cost of capital adjustment is unlikely to be NPV neutral and the regulatory asset approach is by its nature trying to overcome an NPV negative situation (owing to the stranding of the asset) and consequently is unlikely to be NPV neutral.

An issue that has attracted less attention from some regulators is the issue of whether a financeability problem actually exists. Ofwat and Ofgem have both spent significant time and resources defining what is meant by a financeability problem and establishing a set of financial criteria as well as target levels for the criteria so that financial modelling can be used to assess whether a financeability problem exists. Other regulators, such as the CAA in its treatment of the PSDH issues have not applied a financeability test in a systematic way – arguably because time was too limited.

5.4. Lessons for Ofgem

In terms of basic approach to cost of capital, the approach that Ofgem adopted is widely shared by other regulators, both in the UK and overseas. However, even within a widely applied methodology, CAPM, there is room for discretion in the selection of specific elements, and this will have implications for companies.

The embedded debt may constitute an issue when market interest rates vary significantly compared to a long-term average. The impact on companies depends on different factors and Ofgem should consider: (i) the risk of embedded debt problem; and (ii) tools to mitigate, as appropriate.

There is no single accepted approach to addressing financeability problems. Inportantly, establishing a robust approach to determining whether financeability problems exist and then applying this consistently should be a first priority. Whether some of the approaches are more suited to the future situation that Ofgem could face depends on the drivers of the issue and the ability of consumers to accept costs.

6. RISK AND RETURN

A final area to consider is the way in which different regulators have brought together the risk and return trade-off in the overall regulatory settlement or package. This is an important issue as it is the way in which all the elements of the regulatory regime are brought together and the appropriate overall trade-off between risk and return established. Increasingly it is an area that is being considered explicitly by regulators as consumers become better informed about the regulatory regime and companies find themselves less able to achieve "unanticipated" returns and consequently beat the regulatory targets.

6.1. Ways in which risk and return have been addressed

There are probably three main broad ways in which risk and return trade-offs have been considered. These are:

- assessments of the links between the risk inherent in the regulatory settlement and the appropriate required return;
- the way in which general and specific incentives are incorporated into the regime; and
- the role of financial viability in determining the final allowed revenue.

Since the last of these has been addressed in some detail in Section 5, we will focus primarily on the first two aspects in the remainder of this section.

6.2. Making the risk fit the allowed return

In principle any regulatory determination should consider the link between the risk embodied in the regime and the level of return required to compensate for that risk. An annex to the NAO's Pipes and Wires report considered the evidence on the risk-return trade-off and how this changes as the degree of incentive in the regime changes.

Some regulators have considered this type of evidence when determining the allowed rate of return – either through the way that comparators are chosen (or adjusted) or through more ad hoc adjustments to elements of the allowed rate of return.

This approach can be perceived as quite a pro-active approach to the risk-return trade-off. In the UK it has not in many cases been addressed in such a formal way. Rather, when the final determination of a review is underway the allowed return may be perceived as being mostly fixed at whatever rate was proposed at an earlier stage in the process and then the risks that the company is being asked to accept (and the consequent rewards and penalties) are adjusted to find a level acceptable to stakeholders. While it is difficult to document explicit examples of this, and to separate aspects of a proposed determination that are "opening gambits/positions" rather than precisely estimated values, it is fair to say that on average

regulatory positions have been adjusted more in relation to risks being faced by companies rather than the allowed return.[43]

There is an additional aspect of the direct risk-return trade-off. In some cases regulators have perceived the risks associated with a certain project or type of investment as having a different level of risk and so apply a different allowed return. A couple of examples of this approach exist:

- the Competition Commission when reviewing airports for Q4 (the period from 2003 to 2008) proposed allowing a higher rate of return for Terminal 5 (T5) since it was perceived to raise additional risks to the existing airport operations.[44] Specifically, T5 was seen to increase risks by the following four factors:
  - the impact of the proposed trigger for T5;
  - the effective loss of the real option value of delay in the investment;
  - the impact on gearing arising from the borrowing associated with T5; and
  - the risk that targets will be harder to meet owing to T5 and consequently BAA being financially disadvantaged;

  These factors led the Competition Commission to increasing the overall allowed rate of return for BAA owing to T5 by 0.25%. When combined with some other factors this meant that the overall allowed rate of return was set at 7.75% rather than the 7.21% that had been proposed for "normal" assets. While the CAA in its final determination did not use the same specific arguments, it did adopt the 7.75% cost of capital and referenced the risks of T5 as part of the justification; and
- the French energy regulator has proposed an additional incentive of 3% for investments in the gas transmission network for 10 years which help expand capacity on the network and reduce the number of balancing zones.

To date Ofgem appears to have fallen more into the more prevalent category of regulators that have adjusted risk to fit returns.[45] Neither has it offered additional incentive through the allowed return for any projects incorporated into general price determinations.[46] As a

[43] Of course, having created an expectation among stakeholders with regard to a specific allowed rate of return it may be more difficult for regulators to adjust that, especially if it requires an upward revision and an increase in prices, while reducing risks and so making the proposed allowed rate of return acceptable to the companies may be easier and, in some instances, less transparent to other stakeholders.

[44] See section 4.70 to 4.73 of Competition Commission Report on BAA London Airports, November 2002.

[45] Some work on risk-return analysis was undertaken as part of the gas distribution price review by stakeholders and shared with Ofgem but it is not clear if this affected the final outcome since the analysis proved inconclusive. See for example OXERA's September 2007 report "Is there a risk differential between energy networks" and Centrica's response to the same Initial Proposals from Ofgem.

[46] Ofgem issued an initial consultation on enhanced transmission incentives in December 2008. The document considered the case for providing new financial incentives to the electricity transmission companies to

minimum it would be appropriate to undertake a more formal risk analysis when assessing the allowed rate of return although this will only be one of the inputs to the final decision about the allowed return until more conclusive evidence on risk and return becomes available.

6.3. Role of incentives

The second approach to the question of the risk-return trade-off is to consider the way that the overall package of incentives can impact on the returns available to the company. This is an approach that has only recently been considered in a systematic transparent way, by Ofgem as part of the most recent electricity distribution price review consultation document, although had been considered partly by other regulators – see for example the fourth reason given by the Competition Commission for increasing BAA's allowed return for Q4 previously noted.

Implicitly there has been an assumption that the average reward or penalty available under either a specific or general incentive would be zero or possibly slightly positive. The latter is possible because:

- regulators tend to need to err on the side of caution when setting targets (linked to the financial viability issue discussed below) which allows companies an opportunity to make positive returns; and/or
- some additional incentive is needed for a company to undertake an activity which in the medium- to long-term will be positive for consumers but which effectively requires an upfront payment (the French energy regulator's additional 3% return could be viewed this way).

When setting the allowed rate of return it has been assumed that the incentive payments are neutral and so the risk-return balance is provided.

This would not hold if on average companies expected to earn positive returns from incentives and the risk-return balance could be skewed in favour of the companies. Now, the evidence provided by Ofgem of the returns earned from incentives during the existing price control regime can only provide *ex post* evidence on returns but the significant positive values for the vast majority of companies would suggest that *ex ante* it would be surprising if the companies had not expected positive returns.

This positive move by Ofgem and the partial earlier elements noted by other regulators are clearly something that are positive for both transparency and improving the calibration of

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anticipate future demand from generators and invest efficiently to meet that demand in light of the current significant delays which new entrants are experiencing. It also requested views on options put forward by transmission licensees – which included enhanced rates of return, greater scope for funding pre-construction works, and allowing investment in advance of firm financial commitments from generators. Ofgem is expected to develop proposals during the first quarter of 2009.

future incentive rewards and penalties. As such, building on this and being clear about what expected values are being incorporated into a determination will improve price setting.

6.4. Role of financial viability

Finally, regulators have tended to make additional adjustments for "risk" when considering the financial viability assessment of companies. The whole approach to financial viability is discussed elsewhere in this report.

6.5. Summary

It has not been standard practice, in the UK or elsewhere, to be transparent about the final risk-return trade-off incorporated into a determination. Rather, implicit assessments, often based on establishing a level of risk that is acceptable given a fixed view about the allowed return, have been undertaken.

While this has recently been challenged in some circumstances there is still much that could be considered with respect to improving transparency and establishing best practice for the incorporation of incentive based rewards and penalties into the overall risk-return determination. This is an area that deserves further research and analysis.

7. CONCLUSIONS

This conclusions section considers the lessons that Ofgem can learn and issues for further consideration in the light of our review of the application of incentive based regulation in the main regulatory regimes in the UK and a selection of overseas regimes, including ones used in the US, Australia, Ireland, the Netherlands and France. This section focuses on three key parts of our study:

- What are the key differences and similarities between the regimes considered?
- What has worked well and not so well in the regimes considered?
- Options for developing the overarching regulatory framework.

There is much evidence to suggest that the incentive based framework for utility regulation has so far worked quite effectively in meeting many of the objectives that have been associated with utility regulation. In particular, most sectors that have applied the framework for operating expenditure have seen substantial efficiency savings compared to the period before independent regulation (and often privatisation). There have also been substantial levels of capital expenditure, particularly compared to when the same companies were operated in the public sector. There is also evidence to suggest that the quality of service received by customers, including network reliability, has been high and improving. All of these factors were identified by the NAO in its Pipes and Wires report that largely endorsed the RPI-X framework, albeit a number of years ago, and before a number of the key challenges facing the energy sector, particularly to meet environmental challenges, had become apparent. Although there has not been a similarly comprehensive independent review of the performance of the RPI-X framework since the NAO report, there have been a range of indications that its performance remains generally good. However, clearly there are lessons that can be learned through this type of review.

7.1. What are the key differences and similarities between the regimes considered?

Our review of the different regulatory regimes in the UK has identified a substantial degree of alignment in the approaches adopted by regulators. This is shown through a number of key features of incentive based regulation in the UK, including:

- Most price controls are set for a period of five years. The only exceptions to this are sectors where the regulated company is subject to some competitive pressures, e.g. post, or a very different form of private involvement is taking place, e.g. the London Underground.
- The approach to setting operating expenditure allowances and providing incentives to minimise these costs tends to be similar across regulators. Most regulators seek to establish a "base year" of costs employing the most recent year of audited cost information and roll this forward using an assessment of the future potential for

efficiency savings. Regulated companies generally retain any underspend on opex, but bear the costs of any overspend within the price control period.

- Most UK regulators use some forms of pass through and/or re-opening mechanisms to address risk and uncertainty. A number of costs, including business rates, commonly form part of a pass-through. There are differences in the detailed approaches to re-openers with for example, Ofwat having a detailed list of items for which companies can apply for a re-opener as well as a general "shipwreck" clause, while Postcomm just uses the more general "shipwreck" clause.
- The approach to setting the cost of capital tends to be very similar and based primarily on the a weighted average cost of capital (WACC) with equity costs estimated through the Capital Asset Pricing Model (CAPM), with some supplementary considerations. UK regulators have also taken a broadly similar approach to assessing whether price control settlements are financeable, based on considering whether the companies would be able to achieve comfortable investment grade credit ratings on the basis of the ratios used by credit rating agencies to make such assessments.

The degree of alignment in the approaches of UK regulators is not surprising given all their price control decisions are subject to potential appeal to the same body – the Competition Commission. Even though the number of appeals has been low, especially since 2000, the Competition Commission's automatic involvement in the airport price determination process plus other related cases (such as telecoms) provides an indication to regulators of likely decisions on issues such as the cost of capital. Also there have been various efforts to promote alignment between the approaches of the different UK regulators, especially on technical issues such as the Smithers report about cost of capital. Furthermore, regulators have tended to cross-refer to each other's decisions when developing methodologies at price control reviews.

The differences between the approaches adopted by Ofgem and other UK regulators tends to focus on incentives for capital expenditure and the role of consumers in helping set price controls. Ofwat and Ofgem have tried to develop better incentives for efficient capital expenditure, including the use of rolling incentives and the introduction of menu regulation. In part this reflects the importance of capital expenditure to the regulatory settlement in these sectors, which has only increased in recent years.

The introduction of menu regulation reflects that even after 20 years of regulation, both these sectors consider that significant issues remain to ensure effective incentives for efficient capital expenditure. The CAA for Heathrow airport's Terminal 5 project also used quite an innovative approach based on triggers linked to key milestones in the project. In contrast, other regulators for whom capital expenditure is less important have tended to rely on a simpler form of RPI-X incentives, e.g. post. When setting capital expenditure requirements Ofgem and the CAA have made greater use of direct evidence about customer

demand for specific investments than other regulators. For expansions of gas entry capacity, Ofgem has introduced long term auctions to reveal shippers' demand for additional capacity. For the recent price control reviews of Heathrow and Gatwick airport, the CAA used a process of Constructive Engagement to encourage dialogue between the airport owner (BAA) and the airlines regarding future expenditure requirements. Ofwat has tended to rely on less direct evidence in the form of cost benefit analysis provided by the regulated companies – although this does incorporate willingness-to-pay evidence from consumers. Other regulators tend to rely on engineering assessments of the need for capital expenditure.

While there are greater differences between the approaches employed by Ofgem and regulators in other countries, there is also evidence that regulators in other countries have to some degree adopted and adapted the RPI-X/ incentive based regulatory framework developed in the UK. For example, the French and Irish gas sectors have simplified forms of RPI-X regulation. The US has a greater variety of approaches to incentive based regulation, including notably the use of price caps with control periods greater than five years, but there remain many similarities with approaches adopted in the UK. As each state in the US has regulatory responsibilities together with federal organisations, there are a wide variety of regulatory approaches used, including continued reliance on rate of return regulation, which has limited incentives for efficiency savings. As we discuss further below, perhaps one of the most interesting aspects of comparisons with other countries is to consider whether the generally more complex incentive based regimes in the UK have delivered commensurate benefits compared to simpler regimes in other countries.

It is also important to bear in mind when considering which options have been tried in different regulated sectors that the culture of the regulators (including the commissioners/ staff) and the regulated companies affect the approaches adopted. All regulator and company relations will be characterised by a degree of tension, but a very poor relationship can make effective regulation extremely difficult, while on the other hand an excessively close relationship can raise concerns of regulatory capture. Perhaps the most effective regulation occurs where there is a healthy tension, but accompanied by mutual respect. Furthermore, the statutory framework, degree of independence of the regulator, role of Government (perhaps as an appeal body), the political and cultural environment of a sector, the historical approach to regulation, and the industry structure in terms of ownership and vertical/ horizontal separation will all affect how it is applied. This is particularly important to bear in mind when comparing approaches in different countries.

7.2. Incremental improvements

Some of the differences between the regulatory approaches may provide areas for Ofgem to consider further as part of the RPI-X@20 review. Some of these areas may be particularly relevant given the challenges that Ofgem will face when regulating the UK energy sector in the future. Although there are differences in the use of output measures across regulators, we have not identified this as a particular area for further consideration because in our view

there are not particularly good examples from other regimes that Ofgem could consider. It is more likely in addressing this issue that Ofgem would need to develop approaches primarily from first principles. The three options we have considered are:

- Customer involvement and the use of constructive engagement.
- Price caps set for more than five years.
- Dealing with capex uncertainty.

Customer involvement and the use of constructive engagement

Customer engagement can occur in two ways (not mutually exclusive), namely:

- *ex ante* involvement in the price determination process; and
- *ex post* involvement through the right to appeal.

As noted above, Ofgem has been relatively innovative in efforts to involve the direct customers of the regulated transmission businesses in *ex ante* investment decisions, since they are increasingly moving to a position where only investment backed by a clear customer demand and financial commitment is included in the price control (these approaches are now a key feature for gas entry and exit capacity). Although it is notable that with the challenges of extensive investment on the electricity transmission network, and given the nature of the Government's renewables target, Ofgem is encouraging transmission companies to consider building some assets ahead of a clear user commitment to use and pay for the assets.

The CAA has used a variant of this approach, called constructive engagement, during the recent price control reviews of Heathrow and Gatwick airports. An assessment of the success of these approaches will depend on your view of the criteria and counter-factual against which to compare outcomes. However, there is some evidence of better engagement between the airports and airlines, albeit the Competition Commission in its Provisional Findings and Provisional Decision on Remedies for its Market Investigation of BAA's airports has identified areas for improving constructive engagement. The approach largely broke down for Stansted airport, where the views of the airport and airlines appeared too far apart to be closed through discussion. This approach is also an example where there are large intermediaries as the direct customers of the regulated entity, i.e. the airlines.

From reviewing other sectors the much greater challenge is how to better involve consumers in decision making where the direct customers of regulated companies are not large well informed intermediaries. The water sector is perhaps the best example of this where the Consumer Council for Water (CC Water) has a relatively important role in the price control process and extensive surveys of consumer willingness to pay for certain improvements and projects are carried out and carefully assessed. To date, other regulators have generally

utilised consultation and surveys of consumer attitudes but struggled to identify anything particularly innovative beyond these approaches.

Ex post involvement has been more limited although examples exist in telecoms and energy, with the latter focused around code modifications rather than price determinations. However, there are discussions under way on the possible appeals role for airlines in a reformed airport regulatory framework. Also, examples from overseas, especially Ireland, exist of customer related appeal mechanisms, e.g. Ryanair's recent appeal of the Commission for Aviation Regulation's interim price determination for Dublin Airport.

Price caps set for more than five years

It can be argued in capital intensive regulated sectors that a longer term period for a price control can increase the incentives for achieving efficiency savings, not least because there is greater scope to plan investment over the longer term. Indeed although the rolling capital expenditure incentives used by Ofgem and Ofwat do not formally extend price control periods they are designed to help encourage more consistent long term planning. It can also be argued, although it is more debatable and dependent on the nature of measures to deal with uncertainty, that long term price controls are potentially a way of reducing the cost of capital (it is extremely difficult to test cause and effect empirically). A longer term approach appears to have been tried relatively successfully in the US (it was accompanied by re-openers), and was considered, but rejected, by Ofwat in the early stages of its current price control review. While Ofwat recognised the benefits of longer term planning it was not convinced that the information on which it would have to base a longer term price control would be sufficiently robust.

The main difficulty that this approach raises is how to deal with the inevitably greater uncertainty and to some degree risk for opex and capex over the 10 year period. As the examples from the US indicate, a longer price control period would probably need to be accompanied by a greater use of re-openers, triggers and logging-up.

As we appear to be moving into a high investment period in the UK energy sector there may be particular merit in exploring options to set longer price controls than five years given that the absolute value of efficiency savings and any reduction in the cost of capital (if there was one) increases with the size of the capex programme. Alternatively, there may be options that involve splitting the price determination into different elements and considering each of these at different times, say efficiency reviews every five years, capex incentives for greater than five years and new capex reviews every three years (or as needed). While no direct example of this approach exists it could be considered a development of the London Underground Office of the PPP Arbiter (OPPPA) approach which focuses only on incremental capex and opex at each review, with the reviews every seven and a half years.

Dealing with capex uncertainty

This is an area where regulators in the UK have tried various options, which have worked relatively well on a number of occasions. Ofwat has used interim determinations (IDOKs) and logging-up over a number of price control periods, which means that the process is relatively well understood, which should reduce the likelihood that companies submit IDOKs that lack merit. Companies also appear to have confidence in how Ofwat will treat logged-up costs. The CAA's triggers for the capex associated with Heathrow airport's Terminal 5 were also regarded as a relatively successful means to deal with capex uncertainty (at least better than the initial asymmetric IDOK that had been adopted) and new triggers were utilised in the latest determination. Although concerns have been raised by many market participants, the use of auctions and revenue drivers for capex related to gas transmission entry capacity has led to a relatively unconstrained network and timely expansion of capacity. This can be contrasted with a very congested electricity transmission network in parts and a large queue of generators seeking to connect, but unable to do so due to a lack of capacity.

The challenge for Ofgem going forward is to build on what it already does in this area, and incorporate the best of what has been used elsewhere. As compared to some other sectors Ofgem also has the challenge of considering the impact of re-openers and other measures to address uncertainty on the volatility of charges faced by suppliers operating in competitive markets.

7.3. Developing the overarching regulatory framework

When reviewing approaches to incentive based regulation in other sectors and countries for this study we have focused to a significant degree on the detailed elements of the regime, and what options and approaches used in other regimes might provide useful lessons for Ofgem to consider. However, the review also highlights that in some other regimes there are more overarching differences in the approaches adopted to incentive based regulation, including:

- returning to a relatively simple RPI-X framework; and
- placing a greater emphasis on contracting out for new investment.

CEPA organised a workshop for Ofgem in January 2009 that discussed four strawmen that considered options for developing the overarching regulatory framework. A note of the discussions at that workshop will be published shortly on Ofgem's website.

A relatively simple framework

At its heart, and when it was originally set out by Stephen Littlechild, RPI-X or incentive based regulation was a relatively simple concept. The regulator would set an allowance for a number of years into the future, and the company would have an incentive to out-perform

the allowance as it retained those benefits until the price control was reset. Customers benefited from the efficiencies that were achieved because they could be factored into the setting of the new price control. As discussed above, over time the framework has become more complicated, generally in response to some of the perceived shortcomings of the simple framework, including poor quality of service incentives, limited incentives for appropriate and timely capex, and reduced incentives to make efficiency savings towards the end of a price control period. The additional complexity has not been confined to one regulator or sector, and complexity has increased both for the process to set price controls and the detailed licence conditions that implement the controls. The water industry is a good example of a sector with a very intensive and arguably complex process for setting price controls, while the energy sector has relatively complex licence conditions, especially for the transmission price controls.

It is notable that while the framework has become more complicated particularly in the energy and water sectors in the UK, and to some degree the rail sector, other sectors in the UK have retained relatively simple frameworks, including airports, and many of the frameworks used in other countries are quite simple in nature. Although the process for setting price controls for UK airports is relatively complex, the actual price controls are very simple, with a price per passenger for each year and a quality of service rebate scheme. It is notable that the airport's price control in the UK has remained relatively simple despite having been in place for about the same period of time as gas transmission price controls, and while having a similar set of large intermediate customers who are part of the regulatory process. When we discuss relatively simple price controls in other countries, we generally mean a control based on a basic RPI-X framework with a small number of pass-through items, perhaps some quality of service incentives and a one-off process at each review to roll forward the RAB. The Irish and French gas sectors can be broadly described in this way.

While each refinement or addition to the RPI-X framework in the energy and water sectors could potentially be justified on a case by case basis, it is interesting to consider whether the cumulative additional complexity has led to benefits that outweigh the costs created, including through unintended consequences and additional compliance costs. We are not suggesting that the outcomes under simple RPI-X frameworks have always been very good, and we note for example that concerns have been raised in the current Competition Commission Market Investigation of BAA airports about the CAA's approach to regulation, including that it is too light touch. However, concerns have also been raised about some of the outcomes in the more complicated regimes, including for example the evidence of Ofwat being misled by some companies despite the large amount of monitoring activity that is undertaken. There is also a question about how to measure the relative success of regimes, which we acknowledge is not easy, and would probably be most effectively done if robust output measures could be developed.

As a minimum, we consider that it is important as part of the RPI-X@20 project for Ofgem to consider carefully whether any additional complexity over and above a relatively simple

framework, such as applies in the French and Irish gas sectors, can be expected to deliver benefits that exceed costs, and to review this position periodically. Examples of relatively simple regimes in the UK and in other countries can provide helpful counterfactuals for such an assessment.

Greater use of contracting out

Probably the biggest challenge for Ofgem in the future relates to the need for and timing of new investment. This is also arguably where RPI-X regulation has the greatest difficulty responding to the challenge because within a relatively simple framework companies have a lot of discretion about the precise nature and timing of new investment. Therefore, it may be appropriate to consider whether RPI-X regulation in its traditional form should be used for operating expenditure, the existing asset base and perhaps maintenance capex (a core price control), but different approaches could be used for new investment to enhance/ expand capacity or improve outputs. These approaches might include tenders or contracting out of new capex requirements with a view to ensuring that they better meet customer needs. It is important to note that many regulated companies already voluntarily contract out large parts of their capex programmes because they judge it to be the best way to operate with the price control settlement. However, such contracting out is rarely used as a means to identify or check the need for particular investment projects.

Options along these lines have been considered in a number of sectors and countries. For example easyJet and Frontier Economics have developed a proposal for Terminal Tendering in the UK airports sector, which would involve competitive tenders for new terminals rather than an assumption that BAA as the owner of the regulated airports would own, build and operate any new terminal. This approach was also intended to help check the need for a new terminal as the new owner would have no guarantee of achieving the revenue necessary to make the investment profitable so if there were no bidders it would be a signal that the terminal was not required at that time or on that scale. The Competition Commission has expressed some support for this approach in its provisional remedies for its market investigation into BAA's airports.

The new terminal at Dublin Airport has been put out to competitive tender for its operation, although this was not used to determine the need for the terminal. Ofgem and BERR are addressing offshore transmission separately from the core transmission price controls, Ofwat is handling the Thames Water Tideway project outside the core price control and the Thameslink expansion is handled separately from the main Network Rail price control by ORR. Also, in both the Scottish and Northern Irish water sectors investment has been undertaken on a PPP basis. The contracting out approaches discussed above have generally been for discrete (often large) projects rather than covering most or all of a company's capex programme.

In principle approaches based on tendering or contracting out for new investment can be used both to identify the need for investment, specify its scope and to provide assurance that

it is being delivered at minimum cost. Given the range of potential ways to implement this approach it would be important for Ofgem to consider carefully which types of expenditure it would work best for. Implementing these approaches would raise significant challenges for regulators in specifying the core price control (and ensuring that this distinction did not create significant distortions in incentives) and ensuring that tenders or contracts were let on an appropriately competitive basis. For example, the role of the incumbent utility would need to be considered. Furthermore, while for example the use of terminal tendering in the airport sector might allow for a reduction in regulation, it is less clear that this would necessarily be the case if this approach was used for network assets. However, tendering and contracting out can provide mechanisms to lock in financing costs over longer time periods, which provides better value for money for consumers.

7.4. Summary

From our review of regulatory regimes in other sectors in the UK and abroad, there are different approaches to the specific aspects of the RPI-X framework and different approaches to the more overarching framework that Ofgem could consider as part of its RPI-X@20 review. In particular, regulators have considered some interesting approaches for involving customers in the price review process, setting price controls for more than five years and addressing uncertainty in capex requirements. While there are alternative approaches and ideas to consider, there are also a lot of similarities between the approaches used by different regulators in the UK and abroad. This is unsurprising, particularly in the UK, not least because there are various mechanisms and processes that help ensure a degree of commonality of approach between UK regulators, including that they all have the same appeal body – the Competition Commission.

ANNEX 1: THE INDIVIDUAL CASE STUDIES

We have set out below details of the other regulatory regimes that we have considered for this study, and which form much of the source material for the discussion and conclusions drawn in the main report. Each case study is set out in a similar way and covers the context for regulation in the sector, detailed discussion of how the price regulation is set and its form, including the incentives that apply. We have included some sections in each case study that reflect the specific elements of interest for how regulation is applied in that sector.

Table A1.1: The existing regulatory regime in the water and sewerage sector

Element	Existing approach
Context	10 water and sewerage companies were privatised in 1989, these provide the bulk of the services in England and Wales. However, numerous smaller water-only companies existed, and continue to exist, which provide service within the water and sewerage company geographic areas. The companies are vertically integrated regional monopolies, and there is currently very limited scope for competition in the supply of water – inset appointments offer one form that has attracted some attention. This is currently under review. Some consolidation of the sector has occurred but water and sewerage companies are effectively barred from merging (the two contested takeover bids for South West Water in 1997 effectively cemented this position). However, the number of water-only companies has decreased dramatically through merger with other water-only companies or water and sewerage ones. The effective bar on mergers between water and sewerage companies is intended to ensure that there remain sufficient comparators to implement comparative regulation in the absence of substantial competition. Scotland and Northern Ireland have adopted different approaches to reform with contracting of major investment projects through PPP type approaches. The companies in those countries continue to be state owned, although they are subject to independent regulation. The regulator of the water industry in Scotland has been very pro-active in promoting the development of supply competition. Ofwat is currently moving into the later stages of the most recent five year price control review of the regulated companies, with new price controls due to come into effect from April 2009. It is difficult to anticipate all the key changes that will arise from the review as the Initial Proposals have not yet been issued, but Ofwat has already committed to adopting menu regulation as part of its capital expenditure incentives. Professor Martin Cave of Warwick Business School is also currently undertaking a review of the prospects for competition in the water sector, for the Secretary of State for the Environment, Fisheries and Rural Affairs. The final report of this review is due shortly. A particular notable part of the water regime is the role played by the Environment Agency, the Drinking Water Inspectorate and the Government in setting targets and priorities for investment to improve the quality of service. Ofwat uses the advice and requirements of these bodies as a key input to setting expenditure limits.

Element	Existing approach
Overall regime	
Regime	RPI – X + Q (but referred to as RPI + K) Where X refers to efficiency and Q relates to the impact of new investment, especially for improved quality. Within the price control settlement are allowances for expenditure to ensure a supply demand balance.
Description	Five year reviews. Originally ten but five in practice so changed to five formally. For this review companies are required to provide a Strategic Direction Statement that anticipates the challenges and plans for their company over the next 25 years. Tariff basket applied to five items covering measured and unmeasured customers. Effectively a hybrid where: Measured customers – charged as per a price-cap. Unmeasured customers – charged as per a revenue per connection. Differentials between measured and unmeasured prices are limited to specific costs so limiting the options for tariff rebalancing within the basket. Measured costs for large users were traditionally based on estimates of long-run marginal cost, although the link is now less clear. Very large customers are outside the tariff basket. There are indicative separate price limits for the water and sewerage charges.
Reporting	Detailed annual returns are made on outputs, activities and financial performance, amounting to around 1,350 lines of data, which are reviewed in detail by Reporters. In addition to normal financial accounts requirements, regulatory accounts are required, which include current cost accounting and additional information. These are reviewed by Auditors. Ofwat also makes specific requests for draft and final business plans for each price control review. Ofwat issues specific guidance regarding the information that should be included in such plans. Amongst the major changes for the current review has been the specific information required regarding cost benefit analysis of proposed capital expenditure. The Drinking Water Inspectorate and the Environment Agency effectively take responsibility for monitoring some outputs and enforcing when there is non-compliance.
Appeals	Proposed licence amendments, including price determinations, can be appealed by the companies to the Competition Commission. Appeals against the process employed by the regulator are addressed through Judicial Review. There no appeals when the current price controls were introduced in 2004, but two companies appealed in 1999.
Incentives	
Degree of sharing	Asymmetric. The company retains any unanticipated benefits for five years from the date that the saving is made, i.e. there are rolling incentives for opex and capex. No specific allowance is made, except as noted below, for overspends. The focus for assessing unanticipated benefits is through the link to outputs. As noted

Element	Existing approach
	above outputs are now assessed at the project level rather than for activities or services. Proceeds from sale of operational land are shared 50:50.
Overall incentives	Originally a 10 year control (with five year option for review) but now a standard five year control. Asymmetric. Opex and the vast majority of capex are both treated on an *ex ante* basis with any unanticipated savings kept for five years from the date of the saving (so a rolling system). Although Ofwat effectively calculates savings on an annual basis, with the exception of a timing effect there can be some trade-off between annual under and overspends. Overspend, unless captured in the specific controls for specific circumstances discussed below, is excluded. Both opex and capex are benchmarked when the *ex ante* estimate is established. This process is described below. Additional rewards are offered for pre-identified "frontier" companies – in PR04 this took the form of retention of 45% of efficiency savings rather than the 30% allowed for other companies. As part of the planned PR09 Ofwat is consulting on moving to a menu/ sliding-scale approach to capex incentives – similar to the IQI used in energy but called the CIS (Capital Incentive Scheme).
Service performance	There are guaranteed payments for certain service failures in a similar way that customers receive guaranteed payments for certain service failures by electricity distribution companies. Minor adjustment to prices (a small number of percentage points of revenue) for overall performance on service delivery (customer service, drinking water and environmental performance). Ofwat uses comparisons between companies to set some of the quality of service performance measures. Inevitably this leads to debate amongst the companies as to the appropriate basis on which comparisons should be made. Potentially significant penalties for service failure eg. on leakage or customer service. These are not automatic but subject to review by the regulator and discretionary determination of the level of penalty.
Capex	As noted above, the vast majority of capex is handled through the asymmetric *ex ante ex post* system.
Dealing with uncertainty	Specific rules exist for pre-specified events (relevant changes in circumstances, which principally concern changes in legal requirements specific to the water industry), notified items (such as the take up by customers of optional meters), and relevant disposals of land. For events below a materiality threshold the costs (savings) are logged-up (with no allowance for the carrying/ finance cost). Logging-up is now a very formal process with clear requirements for monitoring and subsequent treatment by Ofwat. Events above a materiality threshold are subject to an IDOK – an interim determination of K which is in effect a mini-review focused solely on the incremental costs (savings). Logging-up and IDOKs are symmetrical in terms of ability to request them lies

Element	Existing approach
	with both the company and the regulator.
Pass-through	No pass-through for the current price control.
Re-opener (Ship-wreck)	For major events outside the control of the company there is a general provision for an interim determination for factors other than pre-specified events and notified items – the "shipwreck clause". However, this has to clear a higher materiality hurdle than other forms of re-opener (the IDOKs discussed above). This is a full re-opening of the price control.
Processes for Setting Prices	
Building blocks approach	Revenue requirement allowance = (RAB x allowed return) + Opex + Capex + Tax.
Opex	Based on operating costs for base year of control (up to two years before prices are due to be changed) at the time of the price review (with exceptional items removed):
	Less Ofwat assessment of scope for efficiency savings, based on statistical analysis of companies' data to determine relative efficiency – company assessment of scope for efficiency has very limited role. In addition to the present scope for efficiency, Ofwat also assumes an ongoing shift in the frontier, with below frontier companies assumed to catch-up gradually.
	Plus Limited number of adjustments for factors affecting base operating costs e.g. energy prices or pensions.
	Plus Costs of operating enhanced services – based on company estimate, less Ofwat assessment of scope for efficiency. Ofwat will carefully challenge the need for and cost efficiency of company plans.
Capital Maintenance	Based on company estimate of maintenance spend needed to maintain services, but subject to Ofwat judgment on the strength of the case – the greater the increase from previous levels of spend, the stronger the case has to be. Measures such as serviceability indicators and information about the asset register can be used to inform the analysis. Adjusted for efficiency assessment based on comparative statistical analysis of past spend and comparisons between companies of unit costs for sample projects. Capital maintenance spend is traditionally divided between that on infrastructure (underground assets and reservoirs) and non-infrastructure (other surface) assets. This is a relatively resource intensive process, although the greater weight given to consistency with historical expenditure can reduce the workload.
Infrastructure Renewals Charge (IRC)	The accounting and price control charge associated with infrastructure (largely underground) capital maintenance expenditure. The level of the charge for price setting purposes was calculated traditionally based on an average of past and future spend, but shifting towards a more forward-looking approach.
Current Cost Depreciation (CCD)	The accounting and price control charge associated with non-infrastructure (largely above ground) assets. It is set mechanically, based on existing and new asset values and lives, but subject to a "broad equivalence" check which limits

Element	Existing approach
	the extent to which depreciation may exceed to non-infrastructure capital maintenance spend.
Capital enhancement	Based on company estimates, adjusted for an assessment of the range of projects required and an efficiency assessment based on comparisons of unit costs for sample projects, and in some cases on a general assessment of the reasonableness of the company's approach to costing. Before projects are submitted to Ofwat they will have been assessed and discussed with the Drinking Water Inspectorate and/ or the Environment Agency. There is significant use of cost-benefit analysis when justifying investment. This captures both the willingness-to-pay survey data required by Ofwat as well as environmental benefits. A two-stage process (capturing the interaction of the private and public/external costs requiring assessment) has been established for PR09.
Return	Based on the Regulatory Capital Value and Ofwat-assessed post-tax cost of capital, but subject to adjustments to achieve financial viability in terms of ratios such as interest cover. Cost of capital is based on a notional level of gearing (55% at the last price review) rather than individual company gearing. Ofwat assesses the ability of companies to finance their activities using a range of financial ratios. It has previously allowed specific additional revenue to address financeability concerns. Until the setting of the most recent price control Ofwat gave the small water only companies a small uplift on their cost of capital to recognise that there may be additional costs to raising finance for small companies. The uplift was discontinued at the last review. For the price control from 1999 to 2004 a specific allowance was made for embedded debt, but this was discontinued. It was a significant challenge for Ofwat to set such an allowance.
Tax	Based on an assessment for each company, built up in detail and based on actual rather than notional gearing.
Base Income	Based on current revenue and company assessment of future demand trends, customer numbers, customers switching to metering etc., but subject to Ofwat review and adjustment.
Overall price limit	Based on the difference between the elements of cost projected as above, and forecast income. Compliance with the price limit is reviewed annually by submission of a detailed "Principal Statement", setting out charges, volumes and customer numbers for all customer groups.

Table A1.2: The existing regulatory regime in the postal sector

Element	Existing approach
Overall regime	
Context	Postcomm is the UK regulator for postal services, and is responsible for regulating Royal Mail. Royal Mail is a 100% Government owned company, which has no ability to raise private capital without Government approval. Two formal price control reviews of Royal Mail have taken place, to set price controls from 2003 to 2006 and 2006 to 2010. There is currently a review underway to set the next price control. The Government set up an independent review of the impact of competition in the UK postal sector, which reported last year. The review has proposed that Postcomm's responsibilities for regulating Royal Mail be transferred to Ofcom. The review has not specifically proposed any changes to Postcomm's approach to regulation, but suggested that Ofcom should review the degree of competition in the market to determine the need for regulation.
Regime	RPI – X
Description	The price control that applies to Royal Mail is probably best described as a hybrid of a revenue and price cap. The allowed revenue is set by multiplying unit prices for each product by actual volumes. Royal Mail's actual prices for particular products can differ from the prices used to set the allowed revenue. There are two tariff baskets with different Po and X factors covering most of Royal Mail's retail products (about 90%). The first tariff basket includes services considered to be subject to only limited competitive pressures, while the second tariff basket includes products expected to be subject to significant competitive pressures. There are a limited number of products outside the price control due to the competitive pressures they face. A small number of additional products are subject to high level price regulation or are provided at no cost, e.g. services for the blind. Royal Mail's prices for downstream access products are regulated through the requirement to maintain a minimum margin with equivalent retail products. The price control is for four year from April 2006 to March 2010.
Reporting	Royal Mail has to provide to Postcomm and publish its proposed prices from 1 April each year by 31 December the year before. This must include a demonstration that the prices are likely to meet the revenue/ price cap given volume forecasts. After the end of each price control year Royal Mail must provide audited statements and accounts to show the actual volumes carried and revenue recovered, so that any under/ over recovery can be calculated.
Appeals	Proposed licence amendments, including price determinations, can be appealed by the companies to the Competition Commission. Appeals against the process employed by the regulator are addressed through Judicial Review.
Incentives	
Degree of sharing	Asymmetric. The company retains any unanticipated benefits in opex and capex savings for

Element	Existing approach
	the period of the price control. No allowance is made, except as noted below, for overspends. There are two specific sharing elements in the price control. First, a sharing incentive linked to volume outturns. This mechanism has a deadband where there is no revenue adjustment if volumes are different from forecast, and then outside the deadband if volumes are higher or lower an adjustment is made to revenues that is intended to broadly reflect the variable costs to Royal Mail of handling additional items. Subject to this mechanism Royal Mail bears the risk and obtains the rewards of differences between forecast and actual volumes given the nature of the revenue/ price cap. Second, a sharing incentive linked to changes in Royal Mail's pension deficit and costs. This incentive has a deadband within which Royal Mail's bears the balance sheet and cashflow risk of changes in its pension deficit. There are then two "corridors", which allow Royal Mail to recover more quickly the cashflow impact of any change in its pension deficit.
Overall incentives	Asymmetric. Opex and the vast majority of capex are both treated on an *ex ante* basis with any unanticipated savings kept for the remainder of the price control. Overspend, unless captured in the specific controls for specific incentives or re-opener are not allowed. Both opex and capex are benchmarked when the *ex ante* estimate is established. Both types of costs are also subject to bottom-up assessment ex ante. This process is described below. Royal Mail bears volume risk subject to the sharing mechanism discussed above.
Service performance	Up to 5% of Royal Mail's revenue is subject to performance against reliability targets for its retail products. Where Royal Mail's performance falls below the targets, each percentage point below the target leads to a percentage point reduction in revenue for that product. For business customers the reduction in revenue is paid directly to the customers as a rebate, while for social customers (those using public tariff products), the reduction in revenue comes through in prices in subsequent years. The regulator can (and has) imposed fines for performance below the five percentage point threshold. Postcomm, in co-operation with Royal Mail and Postwatch (at it was) undertook research of customer's needs and willingness to pay to inform the setting of the quality of service targets.
Capex	There is no specific additional capex incentive beyond the overall RPI-X incentive. This partly reflects that capex is a relatively small component of Royal Mail's cost base. Postcomm has not set out in detail how it would expect to roll forward the RAB in the next review.
Pass-through	No pass-through.
Ship-wreck	There is a general ship-wreck clause that requires Royal Mail to demonstrate a material event outside its control that has had a major financial impact,

Element	Existing approach
	together with demonstrating that this impacts the overall financial position of the company, and therefore the ability to provide the USO. There is provision for an interim review after at least two years of the four year price control that can rebalance, but not increase, overall revenues between the two tariff baskets, and/ or change the margins between downstream access and retail prices. The changes are made through a licence modification. Royal Mail used this mechanism in 2008 to request various changes to the price control. Postcomm only agreed to increase price rebalancing freedom, and rejected requests to change the headroom between retail and downstream access products.
Processes for Setting Prices	
Opex	Based on an assessment of operating cost in a base year, i.e. last year of complete information before the price control is set:
	Less — Postcomm assesses the scope for efficiency savings, based on a combination of internal benchmarking of Royal Mail units, functional benchmarking, total factor productivity assessments and international comparisons. When combined this analysis allows Postcomm to estimate current best practice efficiency and the potential for a shift in the efficiency frontier.
	Plus — Any specific costs not included in the base year that Royal Mail can demonstrate would be efficiently incurred, e.g. pension costs.
Capital Expenditure	Primarily a bottom-up assessment of specific plans put forward by Royal Mail. Postcomm sought to adopt an assessment based primarily on demonstrating that capex would lead to net benefits or was otherwise statutorily required.
Depreciation	Straight line depreciation based on asset lives proposed by Royal Mail and reviewed by Postcomm.
Return	Based on the Regulatory Asset Base and Postcomm-assessed post-tax cost of capital. The RAB approach was used for the first time for this price control, with the price control previously being cash based, with capex allowed for on a pay-as-you-go basis.
Tax	Uses statutory tax rates.
Financeability	As Royal Mail is Government owned the issues about credit ratings, etc, do not arise in the same way as other industries. Postcomm undertook analysis to satisfy itself that Royal Mail could finance its activities given the price control settlement, including continuing to provide the universal service.
Base Income	Based on forecast volumes for each product, which incorporate projections about new households, macro-economic factors, etc.
Overall price limit	Apply Po and X factors to prices at 31 March 2006 and use actual volumes to calculate allowed revenue. Some rebalancing of prices is permitted within each tariff basket without the specific approval of Postcomm. Royal Mail can apply to Postcomm for additional rebalancing flexibility.
Implications	

Element	Existing approach
Key incentives for the company	Royal Mail benefits strongly from growing volume as it obtains unit prices that are substantially greater than the marginal cost of handling additional items. Conversely it is exposed to falling volumes with a relatively fixed short term cost base. The volume adjustment mechanism provides some protection from this downside risk. The use of two separate tariff baskets increases the risk of under recovery because it cannot offset under recovery for relatively competitive products in the second tariff basket against revenues from products not subject to much competitive pressure in the first tariff basket. While in theory the incentives for efficient opex and capex are very strong, there is concern that Government ownership reduces the effect of these incentives because Government may have other goals for the business. The service quality incentives appear to be very strong and Royal Mail's performance is consistently good, with the exception of when there is industrial action. Some of the incentive may arise from negative media coverage of poor performance.
Performance under the regime	Volumes have been materially lower than forecast at the time of the price control, and this has impacted Royal Mail's revenues and profits substantially. Volumes are lower because of increased competition through use of downstream access and a general stagnation of overall postal volumes. There is disagreement between Postcomm and Royal Mail about whether efficiency targets have been achieved, but Postcomm believes that Royal Mail has failed to achieve the 3% annual opex efficiency target. Royal Mail's actual capex is substantially lower than that allowed when the price control was set.
Principal sources	
Royal Mail's Price and Service Quality Review 2006-2010, Licence Modifications Proposals, Postcomm, March 2006. Review of Royal Mail's pricing freedom and the level of access headroom (the 'Interim Review' of the price control), A Decision and Direction by the Postal Services Commission, Postcomm, January 2008.	

Table A1.3: The existing regulatory regime in the airport sector

Element	Existing approach
Context	BAA operates the UK's three regulated (designated) airports (Heathrow, Gatwick and Stansted). It is owned by Ferrovial, the Spanish construction company and is regulated by the Civil Aviation Authority (CAA). Heathrow and Gatwick operate subject to the decisions of the fifth Quinquennial (Q5) price review, which covers 1 April 2008 – 31 March 2013. Stansted was granted a one year extension to its Q4 price controls due to consideration by the Department for Transport (DfT) as to whether it (and Manchester airport) should be designated. Stansted will enter its own Q5 on 1 April 2009. The Competition Commission gave its report to the CAA for this price control review in October and the CAA published its proposals for the price control last year. This review has included suggestions by the CAA for alternative forms of price control to one based on a RAB. The CAA has been concerned that RAB based price controls give BAA an incentive to over state capex requirements. The CAA has proposed alternatives that are based on an estimate of the long run average incremental costs for an airport. easyJet has been given leave to seek judicial review of elements of the Gatwick price control that the CAA set. The current price controls for the regulated airports are expected to be the last that are set under the current regulatory regime. The DfT is currently reviewing the regulatory regime with a view to bringing forward proposals to change the regime. The Competition Commission is in the final stages of its Market Investigation of BAA's airports. The Provisional Decision on Remedies includes divestment of of two of BAA's three regulated London airports, plus a range of recommendations to the DfT about how the regulatory regime should be changed.
Overall regime	
Regime	RPI – X
Description	Each of the UK's regulated airports (Heathrow, Gatwick and Stansted) are subject to separate revenue per customer cap. Each airport is treated on a "single-till" basis and so, while aeronautical charges are price controlled, calculation of the cap required costs for entire business and net off expected revenue from non aero-nautical charges). Prices are regulated on the basis of a passenger-yield.
Reporting	Annual accounts are required by the regulator. However, owing to the lack of licence requirements in the 1984 Airports Act the regulatory accounts have tended to be seen as less informative than would otherwise have been the case. This, as well as the broader issue about establishing a licence is, under review by the DfT.
Appeals	Appeals are primarily limited to judicial review owing to the processes currently in place for price reviews. Reviews are commenced by the CAA which prepares a referral to the Competition Commission (CC). The CC then undertakes a review, taking submissions and holding hearings with all key stakeholders, and then reports to the CAA. The CAA then takes the final decision regarding the

Element	Existing approach
	price control. Unlike legislation in other sectors, the CAA is not bound by the CC's views but rather can take a different position if it believes that to be appropriate. This process, and the broader question of airport regulation, is under review by both the CC and the Department for Transport.
Incentives	
Degree of sharing	Approaching symmetry. Underspend and efficient overspend are reflected in the roll forward of the RAB at the following price review. The net proceeds from disposals are adjusted in the RAB (rather than the written down value). The CAA does not subtract the value of write-offs from the RAB.
Overall incentives	Five year control. Asymmetric. Opex treated purely on an *ex ante* basis, capex treated on an *ex ante* basis but with the caveat of *ex post* evaluation. Triggers for selected capital investment projects lead to a reduction in the airport charge allowance should BAA fail to reach a pre-specified milestone within a certain time-frame.
Service performance	Financial incentive against a basket of service quality measures (including: departure lounge seat availability, cleanliness, way-finding, passenger sensitive equipment, arrivals baggage reclaim, transfer search, pier service, etc.), with a maximum bonus of 2.24% and a maximum rebate of 7% of each airport's annual charge revenue. The main service objective relates to central (and to a lesser extent staff) security queues, requiring 95% of waiting times in a month to be below 5 minutes and 99% to be below 10 minutes at Heathrow (15 minutes at Gatwick). The balance of risk of the performance targets is clearly negative for profits.
Capex	"Lumpiness" in investments is treated through profiling of the revenue requirement within and across control periods. The adjustment is made once the revenue requirement has been adjusted by RPI-X, effectively smoothing the changes in access charges over time. The CAA conducts a mid-term review of capex efficiency and the consultation process around capex projects two years into the price control period. Price control includes a "wash up" mechanism for out-turn capital expenditure in the final year of the previous control period. Actual capex is rolled up annually within the RAB during the control period. Evaluated *ex post* for efficiency and the degree of consultation with users prior to the undertaking of capital expenditure projects, which then determines the extent to which it can be added to the RAB at the next price review. An additional return allowance was made for the planned construction of Heathrow East Terminal, but with *ex post* tests on the necessity and efficiency of the expenditure to be undertaken at the time of the next price review and potentially leading to an adjustment in the next period's revenue allowance.

Element	Existing approach	
	The big issues in the regulatory regime tends to be about the scale and scope of large new investments rather than debates about under or over spend of allowed capex.	
Pass-through	A 90% pass-through of security costs is allowed subject to a minimum threshold for each airport. This is subject to an *ex post* efficiency review/adjustment.	
Re-opener (Ship-wreck)	CAA has expressed willingness to reconsider price caps should market circumstances change "significantly". Such a move requires consent from the airport operator. No specific details of what constitutes a significant change have been articulated yet.	
Implications of Incentives	Triggers could result in substantially lower profitability for the airport, although CAA is somewhat vague about the specific terms that would result in a reduction in airport charge allowances.	
Processes for Setting Prices		
Building blocks approach	Revenue requirement allowance = (RAB x allowed return) + Depreciation allowance + Opex – Non-regulated revenues.	
Opex	Based on "underlying" operating costs at the time of the price review.	
	Less	CAA assessment of the scope for company specific efficiency gains, based on internal benchmarking analysis as well as bottom up and top down reviews for each airport. A consideration is also made for potential savings as a result of shifts in the economy-wide efficiency frontier.
	Plus	An adjustment for projected volume growth, based on an assumption of the elasticity of costs to passenger numbers.
	Plus	An adjustment is made for factors affecting operation costs, eg. utility costs, security staff, insurance, etc.
	Plus	An estimate of "atypical" costs, eg. opex stemming from opening/closing terminal buildings.
Capital Maintenance	Based on maintenance costs at the time of the price review, adjusted for expected efficiency savings and projected volume growth, based on the parameters outlined above.	
Infrastructure Renewals Charge (IRC)	Constructive Engagement used to determine need, while cost estimates are largely sourced from the BAA.	
Current Cost Depreciation (CCD)	Depreciation is treated as a fixed amount, based on BAA's current projections of depreciation through the price control period and in line with BAA's own accounting treatment of depreciation.	
Capital enhancement	Constructive Engagement used to determine need, while cost estimates are largely sourced from the BAA.	
Return	Based on a pre-tax real WACC and an assumption of notional gearing (60% for Heathrow and Gatwick at the 2008 price review) rather than the current or prospective gearing.	
Financeability	No adjustment is made for financeability.	

Element	Existing approach
Tax	No specific allowance for tax return since CAA adopts a pre-tax WACC calculation. CAA assumes that the effective tax rate on pre-tax profit is equal to the statutory company tax rate (28% in the latest price review).
Base Income	Income forecasts from non-regulated and commercial activities are based on BAA estimates, which are then reviewed by the CAA as part of Constructive Engagement. A finding by the Monopolies and Mergers Commission (1990) requires each airport to inform the CAA each year of the system used by it to allocate costs to non-regulated activities.
Overall price limit	Based on the difference between the elements of cost projected as above and expected income from non-regulated and commercial activities. The price control is based on a revenue yield per passenger, so the required revenue from regulated activities is divided by the projected number of passengers, which is estimated for each airport by the CAA based on the airport and airlines' forecasts and adjusted for trends in passenger numbers and the expected economic environment.
Principal sources	
Civil Aviation Authority (2008) 'Economic Regulation of Heathrow and Gatwick Airports 2008-2013 – CAA decision'. Civil Aviation Authority (2007) 'Heathrow and Gatwick Airports – CAA price control proposals'. Civil Aviation Authority (2006) 'Airports price control review – initial proposals for Heathrow, Gatwick and Stansted'.	

Table A1.4: The existing regulatory regime in the rail network sector

Element	Existing approach
Context	Network Rail owns and is responsible for the UK's rail infrastructure including tracks, most stations and the signalling network. It is regulated by the Office of Rail Regulation (ORR). The forthcoming control period is the fourth such period and relates to Price Review 2008 and will apply from 1st April 2009. The building blocks of the revenue requirement, as well as the incentive targets, are separately set for England and Wales and for Scotland.
Overall regime	
Regime	RPI – X
Description	Tariff basket applied to two main groups: Fixed charges – based on a revenue cap. Variable charges (usage charge, capacity charge) – set as a price cap on individual categories of charges for passenger and freight vehicles.
Reporting	The ORR monitors Network Rail's expenditure on a quarterly basis. In addition, annual returns must include analysis of variance between actual and assumed expenditure, focusing on whether variance is due to improved efficiency on the part of the company, or changes in prices or output. Audited regulatory accounts are required, which must show splits for Scotland and England & Wales, as well as overall GB numbers. Must include statement of adequacy of resources from Auditors. Accounts are in current prices.
Appeals	ORR have right to refer to CC if Network Rail reject proposals.
Incentives	
Degree of sharing	Approaching symmetry. Deviations from allowance are retained/borne by the company. Underspend is judged in the context of outperformance or underperformance and its impact on the long-term asset condition and serviceability of the network. Any underspend that occurred as a result of outperformance is retained at least for the duration of the price control. Underperformance could result in a deduction being made at the next price review. Efficient overspend is retained by the company for five years. Proceeds from sale of operational land are deducted from the overall revenue requirement on an *ex ante* basis at the time of the price review.
Overall incentives	Standard five year control, but allowing for a large-scale interim review if outcomes deviate or are expected to deviate by a cumulative +/-15% from target for any reason (not necessarily an unforeseen shock). Following the Hatfield crash, the ORR acknowledged a significant change in circumstances and expressed the need for an interim review. An interim review has the same scope as a full price review if ORR decide to carry one out. It is at ORR's discretion to decide whether to conduct a review or not. First, the need for an interim review is established and then required changes in control are determined. Approaching symmetry. Opex and capex are both set *ex ante*, with any unanticipated savings kept for duration of price review as long as they pass the aforementioned

Element	Existing approach
	out/underperformance test. Efficient capex overspend is retained by the company. There is also a mechanism which takes into account the effect of input prices, resulting in an annual logging up/down of the RAB accordingly, with the resulting addition or deduction being made at end of the control period. Only capex will be added to the RAB, starting with the 2009-2014 control period. Incentive payments, which we have historically added to the RAB at the start of the next control period, will instead be remunerated via an opex style memorandum account.
Service performance	Targets established for numerous performance criteria, in particular the public performance measure (PPM), as well as delays, cancellations and significant lateness, and disruption from planned engineering work. In addition, the ORR expects Network Rail to enhance network capacity and to at least maintain the condition of train stations. A target 3% reduction in the risk of death or injury to passengers and rail workers from accidents on the network was established by the Secretary of State for Transport. *Contractual incentives:* Schedule 8 – requires network operator to pay service operators if it fails to meet a condition on the number of delays and *vice versa* if the targeted is bettered in a given year. Delay targets are based on a weighted average of historical figures. Schedule 4 – requires network operator to compensate service operators for temporarily restricting access to stretches of track to allow for engineering work to be done. *Financial incentives:* Volume incentive – allows for additional income at the next price review if Network Rail accommodates growth in traffic in excess of the projections used in its strategic business plan (SBP) for the period. This is intended to align Network Rails' incentives with those in the supply chain below. Asset Stewardship Incentive – allows for additional income at the next price review if Network Rail improves the underlying condition and serviceability of its asset base. Based on a weighted basket of asset stewardship indicators agreed on by the Regulator and Network Rail. *Implications for risk:* Risk to profit clearly increased by Schedule 4, and while Schedule 8 is symmetric, Railtrack's experience in the wake of the Hatfield accident in 2000 points to the risk of a substantial hit to profitability.
Capex	Efficient underspend is logged down annually and retained for five years. Failure to deliver required outputs would result in a reduction of the RAB at the next price review. Efficient overspend relating to additional outputs and sound investment that reduces future costs are both logged up in the RAB at the next price review. Efficient overspend relating to the delivery of required outputs is retained for five years. Renewals overspend is subject to an *ex post* efficiency assessment. Unit cost overspend is generally disallowed.
Pass-through	No Pass-through.

Element	Existing approach
Re-opener (Ship-wreck)	Network Rail may request a re-opener at the point at which it is unable, or expects to be unable within the next 18 months, to finance itself efficiently in the absence of additional funding or a reduction in outputs. Network Rail is also able to request a re-opener if its adjusted interest cover ratio exceeds 1.4x for the forward three-year average (based on Network Rail projections, which need to be independently verified). A separate re-opener clause, determines that, should actual expenditure in Scotland deviate from its allowed level by more than 15%, it would initiate an interim review of Scotland alone. Allowance for a comprehensive interim re-assessment of the controls set if cumulative actual expenditure deviates by 15% in either direction from the allowed expenditure or is adjudged to be likely to exceed 15%. There is also an interim review re-opener provision to revisit the structure of Schedule 4 if there is a material change or proposed material change in the possessions strategy adopted by Network Rail.
Implications of Incentives	Create a strong incentive to outperform targets, while at the same time discouraging inefficient overspend. Re-openers help alleviate some of the concern about risk.
Processes for Setting Prices	
Building blocks approach	Revenue requirement allowance = (RAB x allowed return) + Amortisation allowance + Operating and maintenance expenditure + Schedule 4 and 8 costs.
Opex	Based on company estimate.
	Less: Target efficiency gains, based on the company's own calculations but adjusted according to estimates of catch-up efficiency gains, frontier shift and the impact of input prices.
	Plus: An allowance for non-controllable opex (licence fees, cumulo rates, British Transport Policy costs, etc.), which are based on company estimates. For some of these, the risk of going over is borne by the company, while in cases, a review and adjustment takes place at the end of the control period.
Capital Maintenance	Company estimates are reviewed by the ORR, which assesses each policy individually and considers its relevance in light of demand projections and what is needed in order to maintain the network over the next 35 years. Adjusted for efficiency gains, which are calculated as described for opex above.
Infrastructure Renewals Charge (IRC)	Company estimates are reviewed by the ORR, which assesses each policy individually and considers its relevance in light of demand projections and what is needed in order to improve infrastructure for the next 35 years. Adjusted for efficiency gains, which are calculated as described for opex above
Current Cost Depreciation (CCD)	Based on the regulator's view of steady-state renewals expenditure.
Capital enhancement	Company estimates are reviewed by the ORR, which assesses each policy individually and considers its relevance. Adjusted for efficiency gains, which are calculated as described for opex above.

Element	Existing approach
Return	Shift from Railtrack, which was owned by its shareholders, to Network Rail, which is financed by debt and limited by guarantee, required an allowance for a larger return. Pre-tax rate of return is based on the RAB.
Financeability	Allowances are made for: • a fee payable to the DfT for its provision of the financial indemnity mechanism (FIM); • a risk buffer, which Network Rail has discretion to use in order to overcome fluctuations in cash flow; and • a ring-fenced investment fund, to be used to deliver capital projects or to service Network Rail's debt.
Tax	Based on a detailed assessment of Network Rail's taxable income.
Base Income	A portion of Network Rail's income comes from a government grant.
Overall price limit	A deduction for "other" income (e.g. property, freight, open access, ring-fenced assets, etc.), which is based on the company's own calculations but is then assessed by the ORR, is made from the gross revenue requirement to arrive at the final revenue requirement, based on which fixed access charges are calculated.
Principal sources	
Office of Rail Regulation (2008) 'Periodic Review 2008 – Determination of Network Rail's outputs & funding for 2009-14'.	

Table A1.5: The existing regulatory regime in the Irish gas transmission and distribution sectors

Element	Existing approach
Overall regime	
Context	The Commission for Energy Regulation (CER) regulates Bord Gais' gas transmission and distribution networks in Ireland. Bord Gais is a vertically integrated gas company wholly owned by the Irish Government. It is described in Irish law as a semi-state company. The current price control covers 2007/8 – 2011/12 and is the second full price control that has been set for the transmission and distribution networks. Transmission and distribution tariffs are subject to separate controls, although they are reviewed at the same time. The interconnectors between Ireland and Scotland are part of the transmission price control.
Regime	RPI – X, using the Household Consumer Price Index
Description	Separate revenue caps for transmission and distribution. Both price controls contain a range of incentives and pass-throughs. Both price controls run for five years. Charges are based on a capacity: commodity split. For transmission the capacity: commodity split is 90:10. For distribution the capacity: commodity split is 80:20. The price controls include correction factors for under and over recovery of revenue on an *ex post* basis. The previous price control included an *ex ante* correction factor, but this was found to exacerbate volatility and was not retained.
Reporting	Detailed annual returns are made, which form the basis for the regulator to confirm acceptance of the proposed charges each year. This includes reviewing under and overspends. In addition to normal financial accounts requirements, regulatory accounts are required. These are reviewed by Auditors.
Appeals	The company can request that the Irish Government create an ad hoc panel to hear an appeal against the proposed price control. Appeals against the process employed by the regulator are addressed through Judicial Review.
Incentives	
Degree of sharing	Approaching symmetry. The regulator has stated that the company will keep opex and capex efficiencies for the period of the price control, but any overspends will not be remunerated *ex post* by customers, unless in the case of capex the company can justify that the additional capex was efficiently incurred. The company retains 50% of any revenue obtained from offering additional services in the interconnectors, such as a storage service. There is a unit cost incentive for new connections to the gas distribution network, so the company is only remunerated for those connections it actually undertakes, recognising the uncertainty about the precise number of new connections that will be required. The company has an incentive to minimise the volumes of shrinkage gas. We explain below the use of pass-throughs and partial pass-throughs for some costs.

Element	Existing approach	
Overall incentives	Approaching symmetry. Opex and capex are both treated on an *ex ante* basis with any unanticipated savings kept for the remainder of the price control There is no specific provision for opex overspend, but capex overspend will be allowed at the end of the control period if it can be demonstrated that it is efficient. An assessment of efficient opex and capex is made *ex ante* to set the price control allowances.	
Service performance	There are no specific provisions for revenue to be increased or reduced as a result of poor quality of service.	
Capex	As noted above, the vast majority of capex is handled through an *ex ante ex post* system, which has elements of symmetry. The regulator has indicated that it will include overspent capex in the regulatory asset base (RAB) if the company can demonstrate that it has been efficiently incurred. Due to a legal requirement for a Section 39A consent from the regulator, most new transmission investments require the prior approval of CER even if an allowance has been made for the investment in the price control. This process gives substantial assurance to the company that such investments will be included in the RAB. A trigger has been included to allow revenue when the Corrib gas field is operational and the relevant pipeline is utilised.	
Pass-through	A number of cost items considered to be largely outside the control of the company can be passed through in whole or in part. The levy to fund the regulator, the costs for the independent system operator and the unit price of shrinkage gas are subject to a pass-through. Costs for rates, some safety related expenditure and carbon emissions are subject to a 50% pass-through. The carbon emissions costs are set annually.	
Ship-wreck	There is no specific provision for the price control in general to be re-opened. The regulator would have to set aside the current control and undertake a new review. Such a decision would be subject to a potential judicial review.	
Processes for Setting Prices		
Building blocks approach	Revenue requirement allowance = (RAB x WACC) + Depreciation allowance + Opex.	
Opex	Based on assessing a base year of operating costs usually using actual costs for the last complete year before the price control is set.	
	Less	The regulator assesses the scope for efficiency savings, based on primarily bottom-up analysis of the companies business plan, but supplemented by international and functional benchmarking.
	Plus	Limited number of adjustments for factors affecting base operating costs, eg. pensions.
	Plus	Any expenditure that the company can justify as efficient for the future that is not included in base opex.

Element	Existing approach
Capital Expenditure	Based on a bottom-up review of the company's business plan and proposed capex. Some reference is made to international and functional benchmarking.
Depreciation	Straight line depreciation based on asset lives agreed between the company and the regulator. For some assets included in the transmission price control there are issues regarding the utilisation of the assets and, therefore, the appropriate asset life and depreciation profile. For example, a pipeline has been built to facilitate the connection of the new Corrib gas field, which will have a longer engineering life than the life of the field. The regulator is considering how to handle these issues.
Return	Based on the RAB and the regulator's assessed post-tax cost of capital. The regulator assumes an "optimal" gearing ratio (55% was used in the latest control period for both transmission and distribution). The Cost of Equity is calculated using CAPM.
Tax	Based on the prevailing corporate tax rate.
Financeability	As the company is state owned the issues associated with financeability considered in the UK do not arise.
Base Income	Based on as assessment of future demand trends and customer numbers.
Overall price limit	A revenue cap with allowance for under and overspends. CER reviews compliance with the price limits annually.
Implications	
Key incentives for the company	The evidence from CER's price control review is that the efficiency incentives have variable impacts, which may partly be explained by the state owned nature of the company, which affects the strength and consistency of the efficiency incentives. Given the capital intensity of the activities it is in the company's interests to persuade the regulator to allow as much investment as possible. CER has increased the number of items subject to incentives or partial pass-throughs in an attempt to promote more effort by the company to realise efficiencies. For the transmission price controls, offering additional services that utilise the second interconnector allows BGN to retain 50% of the revenue generated, while the other 50% counts towards the revenue allowance; 50% of rates' deviations from forecast are borne by BGN, with the other 50% passed on to consumers; and each year a price will be set in relation to expected emissions trading costs in the year ahead, BGN will bear 50% of any deviation from this price, with the remaining 50% passed on to consumers. For the distribution price control the same rates partial pass-through as for transmission applies and 50% of the variation of safety expenditure from its projected annual level will be borne by BGN, with the other 50% passed on to consumers.
Performance under the regime	It is relatively early in the price control to evaluate its impact and the company's performance. CER does not publish an annual assessment of costs incurred by the company compared to price control allowances. For the transmission price control there was an over recovery in the first year of the price control due to higher volumes and pass-through and partial pass-through costs are lower than anticipated when the price control was set.

Element	Existing approach
	While the distribution price control has similarly seen lower than expected pass-through and partial pass-through costs, unit prices to recover the allowed revenue are higher than expected at the time of the price control due to lower volumes.
Principal sources	
Bord Gais Networks Revenue Review 2007/8 – 2011/12, Transmission, Decision Paper, CER, August 2007. Bord Gais Networks Revenue Review 2007/8 – 2011/12, Distribution, Decision Paper, CER, August 2007.	

Table A1.6: The existing regulatory regime in the French gas transmission sector

Element	Existing approach
Context	The Commission De Regulation De L'Energie (CRE) is the regulator of the French energy sector, and is responsible for setting charges for the French gas transmission sector. There are two transmission companies operating in France and subject to price control regulation. Suez Gaz de France, through GRTgaz, own and operate most of the transmission system in France. Total, through TIGF, own and operate the transmission system in the South West of France. Suez Gaz de France and Total are vertically integrated gas companies within France. The French gas network is currently very congested for capacity to move gas from the North to the South. This is particularly important for the development of retail competition because the majority of gas to supply France enters the French gas network in the North. Therefore, a key focus of the French gas regulator is to relieve this congestion and help to further promote the development of competition.
Overall regime	
Regime	Incentive based regulation for opex, but with customers receiving the benefits of efficiency savings in subsequent price control periods, and a number of costs being subject to pass-through arrangements. Regulation of capex appears to be a form of rate of return regulation.
Description	The transmission companies are subject to a revenue cap that applies for four years for GRTgaz and two years for TIGF from 1 January 2009. The companies retain 50% of any savings on opex and customers receive the other 50% in the next price control period, which is a form of a rolling incentive.
Reporting	The companies produce annual accounts and tariffs are set each April based on updated forecasts of capacity bookings, inflation and outturn pass-through amounts.
Appeals	CRE makes a recommendation for transmission tariffs to the relevant Government Minister who decides whether to approve it. The Government cannot vary CRE's proposal, but only accept or reject it.
Incentives	
Degree of sharing	For opex there is a 50: 50 sharing of any efficiency gains achieved over the price control period, which customers receive in the next price control period. Companies benefit from any efficiency savings in undertaking capex. It is unclear whether in practice companies would have to pay for any overspends of capex or if they could subsequently be recovered from customers. It appears that for capex the regime is a form of rate of return regulation. There are a number of full and partial pass-through mechanisms that are discussed below.
Overall incentives	Capex is treated on an *ex ante* basis with any unanticipated savings kept for the remainder of the price control An assessment of efficient opex and capex is made *ex ante* to set the price control allowances.
Service performance	There are provisions for monitoring the companies' performance on a range of quality of service measures, including environment, maintenance programmes, the quality of relationships with shippers and the quality of allocations and volume

Element	Existing approach
	information readings. Some aspects of performance are monitored with results being reported, while other aspects of performance are subject to a financial incentive around certain levels of performance.
Capex	The company receives a 3% uplift on cost of capital for 10 years for all investments that increase capacity on the network and/ or reduce the number of balancing zones. This replaces a previous regime that gave a 1.25% uplift on cost of capital for all new transmission investments operational from 2004 and allowed CRE in some cases to offer a 3% uplift.
Pass-through	CRE applies what is described as an Expenses and Revenues Clawback account, which is reconciled over the four years of the price control and appropriate adjustments are made to charges. Included within this mechanism are: • Revenues linked to downstream transmission and storage facilities are 100% included in this mechanism. • For upstream transmission, 50% of revenues are included up to +/-10% of revenue, and 100% of revenues are included above +/-10%. • Income from the connection of CCGTs are 100% included. • Capital costs supported by the companies are 100% included. • The costs of the propulsion of energy and the costs associated with the companies' CO_2 quotas are 80% included. • Costs and revenues associated with GRTgaz's use of the TIGF network are 100% included. • The rewards and penalties for quality of service performance are dealt with through this mechanism. This mechanism combines dealing with uncertainties about costs revenues, so there is no other specific mechanism for addressing under and overspends.
Ship-wreck	There appears to be an ability to re-open the control for GRTgaz after two years, but the precise circumstances in which this can happen and the form of the review are unclear.
Processes for Setting Prices	
Opex	Based on assessing a base year of operating costs (2007), and allowing any forecast changes to cost levels that the companies have been able to justify to the regulator.
Capital Expenditure	The company's forecasts are used. There is pre-funding of assets during the planning phase.
Depreciation	Straight line depreciation is funded on the basis of asset lives determined in 2001 when the original RAB was put in place. The value of the RAB is increased by inflation each year. Costs can be recovered on a case by case basis for stranded assets, which have not been fully depreciated.
Return	Based on the RAB and the regulator's assessed pre-tax cost of capital (7.5%).
Tax	Based on the prevailing corporate tax rate.
Financeability	No specific consideration of this issue appears to have taken place.

Element	Existing approach
Base Income	Based on an assessment of future capacity subscriptions. Customer charges each year will depend on actual capacity subscriptions, inflation and variations in the price of energy to cover shrinkage and balancing costs.
Overall price limit	A revenue cap with allowance for under and over recoveries.
Implications	
Key incentives for the company	The price control appears to provide strong incentives for GRTgaz and TIGF to invest generally, but specifically in assets that can be shown to increase network capacity and/ or reduce the number of balancing zones. This appears to reflect the recognition that such investments are necessary to improve both security of supply and the degree of competition in the French gas market. There are incentives to control opex through sharing of efficiency gains, but some of these incentives are diluted through the use of pass-throughs and partial pass-throughs.
Performance under the regime	It will be interesting to see how the 3% uplift on cost of capital for new investments that increase capacity or reduce the number of balancing zones works in practice, and in particularly whether it seems to lead to substantially more investment. The changes compared to the current price control in the new arrangements suggest that CRE was concerned that the current arrangements did not provide a strong enough incentive for investment.
Principal sources	
CRE tariff proposal of 10th July 2008 for use of natural gas transmission networks, CRE, July 2008.	

Table A1.7: The existing regulatory regime in the Dutch electricity sector

Element	Existing approach
Background	The Office of Energy Regulation (DTe) is responsible for setting price controls for the gas and electricity sectors under the Gas Act and the Electricity Act 1998. The latest regulation period covers 2007-2009 and is the third control period. Regulation is based on yardstick competition, where the performance of the regional grid operators is compared to each other in order to simulate competition between them. The average performance of all the grid managers is taken as the starting point for this.
Overall regime	
Regime	CPI – X + Q Where X refers to productivity improvement and Q relates to service quality. X in this case covers a broader range of improvements than the concept of comparative efficiency of opex as it is normally understood in the context of RPI-X regimes. Since the second regulatory period (2005 to 2007 inclusive), the X factor has been specified in advance of the control period, whereas previously it was applied on an *ex post* basis.
Description	Revenue cap.
Reporting	Grid operators need to submit interruption reports, which influence the value of Q. Operators are required to provide the regulator with a copy of the registration for the past year before 1 March of each year, together with a report in which changes relative to the preceding year are explained.
Appeals	Grid operators can appeal directly to the Trade and Industries Appeals Tribunal.
Incentives	
Degree of sharing	Asymmetric. It appears companies get to keep any unanticipated savings for the duration of the price control while overspend is excluded. The previous regime allowed for *ex post* corrections. The current regime leaves the door open for it, but only if it turns out that the original revenue cap was set at a wrong level because of incorrect or incomplete information.
Overall incentives	The current control period covers 3 years, but the regulator is able to set controls for 3-5 years and says it generally targets the maximum control length. Approaching symmetry. Opex and capex allowances are set *ex ante* but the regulator leaves itself some wiggle room to make *ex post* adjustments should actual outcomes deviate considerably from estimates.
Service performance	No special service incentives beyond the use of a Q factor in setting the revenue allowance.
Capex	No special capex incentives beyond the CPI – X + Q control.
Pass-through	None mentioned.
Re-opener	None mentioned.

Element	Existing approach
(Ship-wreck)	
Implications of Incentives	The symmetry in the quality target not only generates a disincentive to underperform the target but also an incentive to outperform it. Does the threat of *ex post* adjustment to allowed revenue create a perverse incentive not to exceed performance targets?
Processes for Setting Prices	
Calculation of the X factor	The X factor is calculated as being the **actual average annual change in productivity of all networks during the years 2003, 2004 and 2005**. The same X factor is used in the calculation of allowed tariffs for all networks. The X factor in the second regulatory period was calculated – *ex post* – as being the difference in calculated productivity between two separate years (2002 and 2005), rather than as the average annual change between these years. This methodology was changed in the third regulatory period to provide greater revenue certainty for the network companies. Under the methodology used by DTe, the change in productivity is measured as being the change in: $\frac{C}{SO}$, where (for each year and each network company), C is a measure of Standardised Economic Costs, and SO is a measure of Composite Output. **Standardised Economic Costs** are defined as being the sum of operating costs and capital costs (including a cost of capital allowance) incurred by each network business during the years 2003, 2004 and 2005. A number of adjustments are made to this value, including: • changes to the assumed cost of capital in each year (enabling the gradual introduction of a reduced cost of capital allowance in the third regulatory period); • the removal of costs deemed "exceptional"; and • expenditure resulting from Objectifiable Regional Differences (discussed in more detail below). **Composite Output** is essentially a calculation of revenue, defined as being the sum of the product of each sector tariff by the corresponding sector volume for each network. A number of adjustments are also made in the calculation of this value, including a different treatment of connection related services (maintaining prices for these services at 2000 levels). The average annual change in productivity in each year is further adjusted by a "catch-up" value. This adjustment removes so-called historical inefficiencies from the calculation of productivity (ensuring that these are not included in the value of X applied in the third regulatory period). This appears to be a one-off move as DTe had previously given grid operators 6 years to eliminate historical inefficiencies. Finally, an "equalisation factor" is applied to the calculation. This adjusts the calculated level of X to allow for any under / over collection of revenues by each network in the second regulatory period, during which X was set individually for each grid operator.

Element	Existing approach
Regional adjustments	As set out above, the X factor is adjusted to allow for Objectifiable Regional Differences (ORDs) – i.e. structural factors that mean some networks will incur higher costs than other networks. In the third regulatory period, the only ORD identified related to the number of "water crossings" in each network area. A further ORD relating to taxation policy was also identified, but this was removed following a change in taxation rules in 2007. DELTA Netwerkbedrijf B.V. (DNWB) is the only network identified as having costs structurally higher than other networks. Additional costs for water crossings for this network were calculated as being €2.7m in 2006. Initially, ORDs were envisaged as being applied on a "zero sum" basis, but this principle was not applied in the final determination.
Calculation of the Q factor	A value of Q is set for each grid operator and represents a target for the average duration and frequency of interruptions. A grid operator's allowed revenue is increased (decreased) by up to 5% if its performance is better (worse) than the target. For the third control period, Q was calculated based on each grid operator's quality performance during 2003-2005 inclusive). The DTe uses a measure it calls the System Average Interruption Duration Index (SAIDI), which is calculated as follows: $SAIDI = \frac{VM}{AK},$ Where (for each year and each grid operator) VM is the total number of minutes not delivered and AK is the number of connected consumers. The quality performance depends on the valuation of the difference between the "quality measurement" and the "quality norm". • The quality measurement is determined according to the level of the average annual interruption duration for each operator's connected consumers. • The quality norm is determined on the basis of the average annual interruption duration per consumer of all the grid managers during 2004 and 2005 (data prior to that was deemed unreliable). The DTe aims to set the quality norm for future price reviews in advance, as such, the Q factor for the fourth control period will be equal to the average annual interruption duration per grid manager, measured for the years 2006, 2007 and 2008. *Force majeure* events are excluded from the quality control.
Return	Based on the Standardised Asset Value and a pre-tax real WACC. The allowance for the cost of capital is made through an (inverse) adjustment in X. DTe applied a gradual shift from the 6.6% WACC used in the first two control periods to the one used in the third period. This affected the value of X used in each year of the third control period. The cost of capital is based on a notional level of gearing (60% at the last price review) rather than individual company gearing.
Financeability	No allowance mentioned.
Tax	Allowance based on the corporate tax rate is indicated in the government's most recent Tax Plan (29.1% at the last price review).

Element	Existing approach
Principal sources	
Netherlands Competition Authority (2006) 'Final method decisions for regional grid managers in the electricity sector 2007-2009'.	

Table A1.8: The existing regulatory regime in the Australian water and sewerage sector

Element	Existing approach
Context	Water pricing regulation is carried out by independent bodies in each state or territory. The national regulator, National Water Commission, plays no role in individual determinations. The Independent Pricing and Regulatory Tribunal (IPART) is the utility regulator for New South Wales. It sets separate price controls for water to metro areas and bulk water (to farmers, industrial users and metro area suppliers). IPART is currently undertaking a price review of Sydney Water Corporation, which will become effective on 1st July 2009.
Overall regime	
Regime	CPI +/– X
Description	Price control are set for water, sewerage and several auxiliary services separately. All items are subject to a price cap. In the case of metered residential users, price control is divided into a usage charge, which reflects the regulator's estimate of the long run marginal cost by the end of the control period, and a service charge, which represents the residual revenue requirement and is meant to act as insurance against cost/ revenue fluctuations.
Incentives	
Degree of sharing	Asymmetric. The company retains any unanticipated benefits for the remainder of the control period. No allowance is made, except for the pass-through case noted below, for overspend. Land disposal (or any other disposal for cash) is deducted fully from the RAB.
Overall incentives	Four-year price control, but determination remains in force beyond the four years unless superseded by a new control. Asymmetric. Opex and efficient capex are both treated on an *ex ante* basis with any unanticipated savings kept by the company. Overspend, unless captured in the specific controls for the specific circumstances discussed below, is excluded. Both opex and capex are benchmarked when the *ex ante* estimate is established. This process is described below.
Service performance	A set of specific output targets for water and wastewater services are set, which are based on the company's proposals and then adjusted by the regulator in order to reflect the company's proposed expenditure programme.
Capex	"Lumpiness" in capex is smoothed over the duration of the price control period. Capex is included in RAB in the year it is incurred, half of it is assumed to have occurred at the start of the year and hence is fully indexed, while the other half is assumed to occur at the end of the year and is not indexed.
Pass-through	Pass-through allowed for Sydney Catchment Authority's (SCA) bulk water prices, which manifests itself in the fixed charge.
Re-opener (Ship-	No mention of the specific terms that would bring about an interim review, but

Element	Existing approach
wreck)	latest price review took place ahead of schedule as a result of a substantial change in circumstances.
Implications of Incentives	The asymmetric over/underspend structure and the fact that there is no indication that underspend is subject to a test of whether it is the result of improved efficiency or service reduction could have the perverse effect of encouraging Sydney Water to cut down some of its services if it suspects that maintaining them would result in overspend.
Processes for Setting Prices	
Building blocks approach	Revenue requirement allowance = Operating expenditure + Maintenance expenditure + Administrations expenses + Allowance for working capital + Return + Depreciation
Opex	Based on operating costs at the time of the price review:
	Less Estimated efficiency savings, based on company forecasts and a consultant's study, which are then reviewed by IPART. Efficiency is looked at both from the point of company "catch-up" and a frontier shift.
	Plus Allowance for contribution to the Climate Change Fund.
Capital Maintenance	Based on company estimate, adjusted for efficiency assessment as described above.
Infrastructure Renewals Charge (IRC)	Based on company estimate, adjusted for efficiency assessment as described above.
Current Cost Depreciation (CCD)	Straight line method based on expected asset lives for new assets and a weighted average of the remaining asset lives for existing assets.
Capital enhancement	Based on company estimate, adjusted for efficiency assessment as described above.
Return	Based on the RAB and IPART-assessed real pre-tax WACC. Cost of capital is based on a notional level of gearing (60% at the last price review) rather than individual company gearing.
Financeability	Adjustment for financeability is made via the pass-through mechanism, with no additional allocation in the revenue allowance.
Tax	No specific allowance for tax return since IPART adopts a pre-tax WACC calculation. IPART assumes that the effective tax rate on pre-tax profit is equal to the statutory company tax rate (assumed at 30% in the latest price review).
Base Income	Based on company estimates of future trends in customer numbers and demand, reviewed by IPART.
Overall price limit	Water – volumetric charge set to equal IPART's estimate of the long run marginal cost, with the fixed charge calculated to make up the rest of the revenue requirement. Sewerage and other services – fixed charge only.

Element	Existing approach
Principal sources	
Independent Pricing and Regulatory Tribunal (2008) 'Review of prices for Sydney Water Corporation's water, sewerage, stormwater and other services'.	

Table A1.9: The existing regulatory regime for the State of Victoria's five electricity distribution businesses

Element	Existing approach
Overall regime	
Regime	CPI – X + S Where CPI is the change in customer price index, X refers to efficiency and S is a service adjustment incentive (an incentive on service reliability performance and customer service).
Description	Prices are controlled under a weighted average tariff basket approach for each distribution company. Following the (annual) addition/ withdrawal of any tariff, responsibility remains on the company to show the basket of tariffs is compliant with the control. Opex and capex efficiency gains/ losses from 2001-05 retained for a full five years (irrespective of when they were made) through an Efficiency Carryover Mechanism. A licence fee pass-through also applies.
Reporting	Aside from regulatory accounting reporting requirements, tariff reporting requirements include a Tariff Strategy Report for the control period and an Annual Tariff Report (submitted at least 40 business days prior to the commencement of each calendar year). Detailed reporting requirements also apply to service performance, including indicators relating to service reliability, quality of service and customer service.
Appeals	Under the provisions of the Essential Services Commission Act 2001, the distribution companies as well as consumers are able to appeal the Commission's Final Determination. Nine appeals were made with regard to the 2006-2010 determination (with two being upheld). Appeals are heard by a three member Appeal Panel specially constituted for the appeal, rules for membership etc are set out in the Act.
Incentives	
Overall incentives	Five year price control, applying from 1 January 2006. P_0 reductions applied to tariffs of all five companies in 2006 (ranging from 4% to 17% for distribution services[47]). Subsequent X values of 2.5% applied to all companies. The Efficiency Carryover Mechanism (ECM) is a "roller" mechanism whereby efficiency gains from opex/ capex underspend are retained for 5 years (irrespective of when they are earned). Capex will not be included in the ECM that applies beyond 2010.
Service performance	Two service incentive mechanisms apply: the **service incentive scheme** (S-factor scheme); and the **Guaranteed Service Level** (GSL) payments scheme. Under the **service incentive scheme**, a company's allowed revenue (through

[47] Separate price controls were specified for metering.

Element	Existing approach
	average prices for all customers) is increased (decreased) based on increases (decreases) in service performance as measured against defined targets. The targets included in the S factor are: • unplanned supply interruption frequency; • unplanned minutes off supply; • momentary supply interruption frequency; and • call centre performance (proportion of calls responded to within 30 seconds). Reliability targets weighted in line with customer preference (according to South Australia customer research data). Targets are defined separately by urban/ rural network type. Incentive calibrated with reference to a Value of Customer Reliability, calculated state-wide to be AUS$30,000 per incremental MWh, and AUS$60,000 for Melbourne Central Business District (CBD) customers. No quality of service measures were included in this financial incentive due to lack of reliable historical performance data. A **Guaranteed Service Level** (GSL) payment scheme also applies, designed to ensure a minimum level of service reliability. Under the GSL, customers who receive a level of service that is worse than defined levels receive automatic payments directly from the distribution companies. An allowance has been made in the revenue requirements of each company to meet a level of GSL payments for the 2006-10 control period.
Degree of sharing	All efficiency gains within control period retained by companies. Customers benefit from (P_0 and annual) price reductions at subsequent controls. Efficiency gains retained by companies for five years irrespective of the years in which they are earned (through the Efficiency Carryover Mechanism). This is a one-sided mechanism (ie. a floor of zero applies for each company). Service performance incentives symmetrical (with targets set at expected performance levels).
Pass-through	Pass through of costs (or savings) permitted relating to: • changes in taxation policy; • financial failure of a retailer; • a declared retailer of last resort event; and/ or • "major projects" events Note that only one project will be considered as a potential "major project" in the 2006-10 regulatory period (a proposed AUS$50.2 million project to strengthen security of supply in the Melbourne CBD).
Re-opener	None specified (aside from pass through events set out above)
Processes for Setting Control	
Building blocks approach	Revenue requirement *allowance* = (RAB x WACC) + Regulatory depreciation + Operating and maintenance expenditure + Cost of company tax + Efficiency carryover amount.

Element	Existing approach
Customer growth forecasts	Forecasts of growth in numbers of customers, consumption and peak demand are critical to converting the revenue requirement into the price control (as well as impacting estimates of load-related capex). Companies bear all benefits (losses) from higher (lower) outturn levels of demand.
Opex	2006 "base" determined from 2004 actual opex, plus a consideration of projected labour cost increases and changes in productivity improvements. Opex requirements for the period then built up by considering "step changes", and applying these through to 2010.
Capex	ESC decided a reasonable aggregate capex level for each company over the 2006-10 regulatory period is an amount 30% greater than the historic expenditure incurred by each company over the 2001-04 period. This was selected after considering (significantly higher) company forecasts and consultant assessments. Capex allowance set at aggregate levels rather than by asset class.
Depreciation	Straight-line depreciation profiles used in rolling forward the RAB over 2006-10 control period. Asset lives were assumed to be as proposed by the each individual company (varying by asset category).
Cost of capital	Post-tax WACC of 5.90% determined for each company. Capital Asset Pricing Model (CAPM) used to estimate the post-tax return on equity.
Tax	Separate allowance made to cover expected taxation liabilities relating to regulated activities over the 2006-10 control period.
Efficiency Carryover Mechanism	Carryover amounts calculated by taking the total NPV of efficiency gains over 2001-05 and incorporating it in the 2006-10 revenue requirement (net of any 2001-05 efficiency losses), with the first year of the latter control period given a significantly higher weight in the allowance than the following four years. In calculating the 2006-10 revenue requirement, capex and opex efficiency gains were included. The ECM for 2011-2015 will only include opex efficiency gains since the regulator argues that the ECM is effective for opex due to its recurrent nature, while arguing that the impact on capex is less tangible since the relationship between revealed expenditure and future capital expenditure is more difficult to establish. It notes the massive variation between actual capex during 2001-5 and companies' proposed capex during 2006-10 as suggesting that capex savings in the former period were more likely to have been caused by temporary "efficiencies" (i.e. deferrals) than by sustainable efficiencies.

Table A1.10: The regulatory regime for Mississippi Power Company

Element	Existing approach
Overall regime	
Regime	Regulated return on investment, with performance based component. Returns are calculated annually (combining forward looking and retrospective elements). Current scheme was introduced in June 2004 (applying to calendar year 2005), and applies until a review is requested by either the Mississippi Power Company (MPC) or the Mississippi Public Service Commission (MPSC).
Description	Rate setting has two components for each calendar year (the Review Period): a **forward looking** element and a **retrospective** true-up. By 15th December each year, MPC calculates a **forward-looking** return on investment for the coming year. This Projected Retail Return on Investment (PRRI) is calculated according to a detailed formula set out by the MPSC. The PRRI is compared to a Range of No Change (RNC), which is a range of rates (combining MPC's cost of capital and a performance element). If the PRRI is within the RNC, then no change in revenue is made. If the PRRI is materially outside the RNC, revenue adjustments are made until an appropriate (projected) return is achieved. The extent of required changes in revenue is also a function of the MPC's performance rating (described more fully below). Changes are capped at 4% of annual revenues of the MPC. By 15th March after each Review Period, there is a **retrospective** calculation of actual Earned Return on Investment (EROI), which is compared to the RNC projected for that year. To the extent the EROI is outside the RNC, an adjustment to rates is made in the next billing cycle. Any retrospective adjustment is limited by the same 4% cap on changes in annual revenue, as described above. If the required change in revenue exceeds 2% of annual aggregate retail revenues of MPC, this constitutes a "major change" and triggers a hearing. Changes of less than 2% are effective on the first billing cycle in February.
Reporting	Sworn filings are required to be lodged by December each year for the detailed calculation of PRRI, CPR and associated working. The calculations of PRRI and CPR are set out more fully below, but include detailed projections of investment, revenues and expenses. MPC is also required to periodically file cost of service studies with the MPSC. More detailed filings are required in the event that a change in rates is proposed (including detailed schedules of current and proposed rates and an analysis of the forecast impact on customers of the change in rates by customer class).
Appeals	The regulatory regime continues until modified / terminated according to changes to the regime requested by the MPC or the MPSC. Any such changes are to be applied for / implemented according to Mississippi law.
Incentives	
Degree of sharing	No explicit sharing of efficiency gains. MPC permitted to earn returns up to the upper boundary of the RNC. Anything materially in excess of this is returned to customers through the retrospective true-

Element	Existing approach
	up at end of year.
Overall incentives	Incentives on MPC apply in two ways: • through the calculation of the **level of the RNC**; and • through the **annual performance evaluation**. The **level of the RNC** is a function of MPC's cost of capital and the Company's Performance Rating (CPR). The CPR is a weighted score (ranging from 0 to 10) that comprises measures of MPC's customer prices (compared to other regulated utilities in the region), customer satisfaction and customer service reliability. The price and reliability components are both weighted twice as heavily as the customer satisfaction component. In effect, this means that MPC is permitted to earn a higher return on investment if it performs well on the three measures of performance. However, if it performs poorly, then the RNC is reduced. At a minimum (i.e. if the CPR is zero), the RNC equals the MPC's cost of capital +/ - 0.5%. The level of the CPR also affects the level of allowed change in prospective rates, as assessed through the **annual performance evaluation.** In the event that the PRRI lies outside the RNC, the size of the revenue adjustment is a function of both the extent to which the PRRI is outside the RNC, and the level of the achieved CPR. As an example, if the PRRI exceeds the RNC, then revenues are required to be reduced by a relatively larger amount if the CPR is low (compared to if the CPR score was high).
Service performance	Service performance is measured and incentivised through two components of the CPR, namely **Customer Service Reliability** and **Customer Satisfaction**. **Customer Service Reliability** is calculated as an index that comprises a number of customer interruptions and the duration of those interruptions. Only interruptions exceeding 5 minutes are included in the measure and there are a number of causes of interruptions excluded from the measure (including *force majeure* events, scheduled outages and street lighting). **Customer Satisfaction** is measured through bi-annual customer surveys, using five questions specified by the MPSC. Survey results are averaged and combined into a customer satisfaction index. Although MPC organises the survey, this must be undertaken by a nationally recognised professional survey firm.
Capex	Projected capex is included for each year in the calculation of the PRRI. The regime is not designed to accommodate "Major Plant Additions." If these are required the MPC is allowed to file for additional rate changes outside of the prescribed regime. These will be considered by the MPSC on an ad hoc basis (according to the law of Mississippi).
Pass-through	No specific pass-through, aside from an annul true-up of returns.
Re-opener (Ship-wreck)	Aside from Major Plant Additions (as described above), reopener only permitted for *force majeure* events that raise costs reduce revenues to an extent that cannot be recouped through the regime. This is addressed as per Major Plant Additions.
Additional notes	

Element	Existing approach
Cost of capital	The cost of capital is a direct input to the calculation of the RNC. As noted above, the MPC's range of allowed returns equals the MPC's cost of capital, plus a performance element +/- 0.5% (i.e. setting the upper / lower bound). The cost of capital is calculated at the end of each projected calendar year according to a formula specified by the MPSC. This "projected weighted embedded cost of capital" includes the projected cost of long term debt, preferred stock and equity. The cost of equity is taken to be an average of the results of three methodologies (DCF, risk premium and CAPM).

Table A1.11: The regulatory regime for Niagara Mohawk Power Corporation

Element	Existing approach
Overall regime	
Regime	Earnings Sharing Mechanism, with a defined acceptable target for Return on Equity (ROE)
Description	Electricity delivery rates were determined by a 10-year rate plan (from 31st January 2002). A 10.6% to 11.75% (post tax) target deadband was defined for the electricity ROE, with earnings above this threshold shared with customers (as set out below). A similar arrangement was agreed for gas, with delivery rates frozen until the end of 2004. Niagara Mohawk has the right to request an increase in rates at any time, if needed. This right was exercised recently and the New York Public Service Commission (NYPSC) is currently gathering evidence relating to the proposed rate increase. ROE is measured on a US GAAP basis and calculated cumulatively from January 2002 to end-December 2005 (and on a two-year rolling basis thereafter).
Reporting	Annual returns, submitted to the NYPSC by June each year.
Appeals	Niagara Mohawk is able to request a rate review at any point. However, if it does so, it may lose any excess returns from the date of the new review.
Incentives	
Degree of sharing	The electricity regime is relatively complex, including risk mitigation clauses for both investors and customers. The profile of revenue sharing is defined around a central threshold ROE of 10.6%. Specifically: • any additional earnings up to 11.75% can be retained by the company (extended to 12.0% if certain customer migration and education goals are met); • earnings above 11.75% (or 12%) and 14% shared equally with customers; • from January 1st 2009 additional sharing rules come into play with returns above 14% shared 75% with customers and returns above 16% shared 90% by customers; and • after the fourth year of the plan, a cumulative assessment of the returns is made, with 50% of any excess return returned to customers. The gas regime is simpler with equal sharing between shareholders and customers beyond the defined "deadband".
Overall incentives	The current rate plan was agreed in the context of National Grid's take-over, designed with the objectives of: • ensuring that customers shared the synergy/ efficiency benefits of the takeover; and • providing certainty for investors relating to both the acquisition and the investment that was necessary for the network. As set out above, Niagara Mohawk may earn a return on equity of between 10.6% and 11.75%, with sharing provisions that apply beyond this deadband.

Element	Existing approach
	Rates are set for the 10 year plan, except for certain authorised adjustments (including the Competitive Transition Charge "reset", discussed in more detail below). Rates can also change every two years if balances in the "deferral" account reach US$100m in either direction.
Service performance	Penalties with total annual pre-tax value of US$24m may be applied if satisfactory service levels are not met (under the Service Quality Assurance Program). US$11m relates to electricity system reliability and US$13m relates to electricity and gas customer service. Specifically: • customer service provisions include standards relating to call centre operations, billing, field services and low income customer assistance; and • electricity reliability standards relate to both service reliability (frequency/ duration of interruptions), and power quality (momentary interruptions). If penalties exceed US$7.5m in any year, these are credited to customers (with lesser penalties entering a deferral account). Low income customer assistance includes a US$5 per month discount on the rate for eligible customers.
Capex	Niagara Mohawk's costs are amortised unevenly over ten years with larger amounts being amortised in latter years (consistent with projected recovery through rates).
Pass-through	All electricity and gas commodity costs may be recovered from customers. The regulator requires actions to limit the volatility in gas prices passed on to customers (met through the use of gas futures).
Re-opener	If cumulative earnings over the first four years exceed 11.75%, in addition to the sharing of benefits (set out above), a re-opener can be triggered. Prices are then to be adjusted by 50% of the annualised amount of excess earnings. If the re-opener is not triggered then it can be triggered at a later date, but only one re-opener is allowed throughout the price control period. In the original settlement, 50% of synergy savings were shared with customers. If rates are reviewed mid-term due to a complaint under Public Service Law, Niagara Mohawk is able to prepare a defence that includes in its revenue requirement 100% of annual synergy savings (from National Grid's acquisition). If rates are reviewed following a filing made by Niagara Mohawk, then all synergy savings are retained by customers. Annual synergy savings and efficiencies from the acquisition were assumed to be around US$190m (with around US$117m a year attributed to New York electricity operations).
Additional notes	
Stranded costs	Electricity delivery rates include the "Competitive Transition Charge" (CTC), which recovers fixed and forecast variable stranded costs (associated with the Company's former electricity generation interests). Through the CTC, Niagara Mohawk earns a return on fixed CTC costs (with the NPV of the return on fixed CTC costs over the 10 year plan broadly approximating the written-off costs of the Nine Mile Point nuclear activities, at around US$850m). The "CTC reset" applies every two years, based on changes in electricity and gas

Element	Existing approach
	commodity prices.
Elevated equipment voltage	Annual targets have been set for the annual testing for "elevated equipment voltage" and for performing visual inspections of all facilities on a five-year schedule (from January 2005). Failure to meet the annual target for performing tests and inspections will result in a 0.75% reduction in return on equity, as will failure to meet the annual target for inspections. Costs of performing these tests can be passed through to customers.
Weather adjustment	The gas rate agreement included a "weather normalisation" clause. This mitigates the impact that unexpected weather could have on gas margin during winter. This clause compares the historical (30 year) average temperature for the day to the current temperature. If the current temperature is higher/ lower than the historical average by 2.2% or more, the Company will either surcharge (due to lower throughput) or discount (due to greater throughput) the customer.
Economic development	An additional US$12.5m per year is available for "economic development". Funding up to this limit is available for an "economic development plan" (agreed with relevant organisations), designed to encourage the "attraction, expansion, and retention" of business customers.
Protection against major events	Niagara Mohawk's returns specifically protected against major storms, hazardous waste remediation, excessive inflation, legislative and regulatory changes and tax and accounting changes.

ANNEX 2: THE ROLE OF THE GOVERNMENT AND OTHER REGULATORS IN SETTING CAPEX REQUIREMENTS

UK rail sector[48]

The role of the Government in setting capex requirements for the rail network operator (Network Rail) stems from the fact that Network Rail is partially financed by a Government grant. In the previous price control period (CP3), the regulator made annual adjustments to the Government grant paid to Network Rail, but in the latest control period (CP4), which covers 2009-2014, the regulator determined the yearly level of the grant as part of its price review and elected not to carry out annual adjustments within the control period. This change followed on from the Railways Act 2005, which granted the Government greater power and a more clearly specified role in setting out the objectives for the rail sector.

According to the Railway Act 2005, the Government determines its expenditure plan for the rail sector as a whole via the Statement of Funds Available (SoFA) and sets out the outcomes it expects in return in the High Level Objectives Specification (HLOS). The Office of Rail Regulation (ORR) then determines whether the outputs sought by the Government are affordable and deliverable within its funding plan. In order to assist the ORR in conducting its analysis, the Government provides the regulator with a set of assumptions on the costs of service provision through the existing franchise regime of train/ station operators and of the revenues available. The ORR then produces a judgment on the balance of outputs to be provided by Network Rail. While there is some consultation between the ORR, Network Rail and other stakeholders as part of the output setting process, ultimately the power resides with the ORR. In the next stage, the ORR calculates how much it should cost Network Rail to deliver its share of the HLOS, based on an assumption of the extent to which it is reasonable to expect Network Rail to improve efficiency over the control period.

At the most recent price review,[49] the England and Wales HLOS sought improvements in safety, train service reliability and to stations, and increases in capacity for passenger and freight services including some specific schemes such as Thameslink. The Scottish HLOS demanded improvements to train service reliability, maintaining the capability of the infrastructure and extensions of the network through three major projects. In the same price review, the ORR adopted the following approach when carrying out the affordability test of the HLOS:

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[48] Sources: Office of Rail Regulation (2008) 'Price review 2008 – determination of Network Rail's outputs and funding for 2009-14.
Department for Transport (2007) 'Delivering a sustainable railway – White Paper CM 7176' accessed at: http://www.dft.gov.uk.

[49] Office of Rail Regulation (2007) 'Periodic review 2008: Network Rail's outputs – a consultation document'.

1. It began by calculating Network Rail's gross revenue requirement for England and Wales and separately for Scotland.
2. It then subtracted the expected costs of Schedules 4 and 8[50] and any third party income. This gave the revenue requirement needed to deliver the HLOS.
3. The ORR then took the SoFAs for England and Wales, and Scotland, provided by the DfT and Transport Scotland, respectively, and deducted from them the forecast base franchise support payments and the incremental franchise support payments that are required in order to deliver the HLOS.
4. The ORR then added the payments that franchise operators are expected to make to Network Rail, based on assumptions made in the DfT and Transport Scotland's SoFAs. This resulted in an estimate of the funds available to Network Rail.
5. The estimate of funds available above was then compared to the revenue requirement calculated earlier to provide an indication of any surplus or deficit.

If the ORR were to conclude that the outputs are not affordable within the funding allocated, the Secretary of State would be requested to revise the required outputs or change the funding available. There is also a provision for "grant dilution", which allows Network Rail to raise its access charges should the Government fail to pay its grant according to a pre-agreed schedule, thus avoiding any negative impact on Network Rail's ability to achieve its objectives.

According to Government accounting rules, direct grants paid to Network Rail count as capital expenditure in the Government accounts. To this end, they are subject to two financial tests, which are carried out by the ORR as part of its periodic review. The two tests are:

- Investment Test – This specifies that Government grants cannot exceed Network Rail's annual capex, which the ORR defines as renewals spending plus capital enhancement. This test must be passed separately for England and Wales and for Scotland, matching the ORR's regulatory accounts requirements.
- Market Body Test – This requires Network Rail's annual income from sales, which the ORR defines as access charge revenue and other single till income, must cover at least half of its production costs, which are defined as operating expenditure, maintenance expenditure and capital depreciation. At the last price review, the ORR added to this a 5% buffer in order to prevent the rule from being breached as a result

[50] Schedule 4 requires Network Rail to compensate service operators for temporarily restricting access to stretches of track to allow for engineering work to be done. Schedule 8 sets targets for delays, which Network Rail has to pay service operators if it fails to meet but earns additional income from service operators if it succeeds in meeting or bettering the targets.

of fluctuations in income and/ or expenditure. This test is applied to Network Rail's total operations in Great Britain.

Costs that exceed the above rules are recorded as current expenditure in Government accounts.

ANNEX 3: DETAILED SUMMARY TABLES

Table A3.1: Overall regime

Sector; Regulator	Length of control	Form of control	Use of pass-through	Type of re-opener
UK:				
Electricity; Ofgem	Five years.	RPI-X for transmission and distribution. The basic RPI-X is supplemented by the use of additional incentives and capex triggers.	A small number of costs considered to be beyond the control of the companies are passed through, including rates and the Ofgem licence fee.	Re-opener can be triggered for specific pre-specified events, e.g. costs incurred following the introduction of the Traffic Management Act. Companies can apply for a disapplication of the price control on 18 months notice, which would force Ofgem to agree a new price control, refer the issue to the Competition Commission, or see it lapse.
Gas; Ofgem	Five years.	RPI-X for transmission and distribution. The basic RPI-X is supplemented by the use of additional incentives and capex triggers.	A small number of costs considered to be beyond the control of the companies are passed through, including rates and the Ofgem licence fee.	Re-opener can be triggered for specific pre-specified events, e.g. costs incurred following the introduction of the Traffic Management Act. Companies can apply for a disapplication of the price control on 18 months notice, which would force Ofgem to agree a new price control, refer the issue to the Competition Commission or see the price control lapse.
Water & sewerage; Ofwat	Five years.	RPI – X + Q (but referred to as RPI + K), where Q relates to the impact of new investment, especially for improved quality. Tariff basket applied to five items covering measured and unmeasured customers and is effectively a hybrid where measured customers are charged as per a price-cap and unmeasured customers are charged as per a revenue cap per connection.	No pass-through.	Events above a materiality threshold are subject to an IDOK – an interim determination of K – which is in effect a mini-review focused solely on the incremental costs (savings). For major events outside the control of the company there is a general provision for an interim determination for factors other than pre-specified events and notified items – the "shipwreck clause".

Sector; Regulator	Length of control	Form of control	Use of pass-through	Type of re-opener
Post; PostComm	Four years.	RPI – X with a hybrid of a revenue and price cap.	No pass-through.	There is a general ship-wreck clause that requires Royal Mail to demonstrate a material event outside its control that has had a major financial impact, together with demonstrating that this impacts the overall financial position of the company. There is provision for an interim review after at least two years that can rebalance, but not increase, overall revenues between the two tariff baskets, and/ or change the margins between downstream access and retail prices.
Airports; CAA	Five years.	RPI – X, which is applied to each of London's three major airports individually. Each airport is treated on a "single-till" basis and so aeronautical and non-aeronautical revenues are subject to the overall price control.	A 90% pass-through of security costs is allowed, subject to a minimum threshold for each airport. This is subject to an *ex post* efficiency review/ adjustment.	The statutory provisions allow an interim review of price caps. The regulator expressed willingness to reconsider price caps should market circumstances change "significantly". Such a move requires consent from the airport operator. No specific figures of what constitutes a significant change were articulated.
Rail; ORR	Five years.	RPI – X + Q (where Q is a volume incentive) with a hybrid of a revenue and price cap, which are explicitly calibrated to match the mix of fixed and variable costs.	Pass-through for traction electricity costs. No other pass-through but an allowance for "non-controllable opex" is made *ex ante* when the regulator determines the revenue requirement for the control period.	The company is able to request an interim review if it is unable, or expects to be unable, to finance itself efficiently without additional funding or a reduction in output. The level at which this can be requested is based on a threshold adjusted interest cover ratio.
Europe:				
Gas transmission and distribution; Ireland; CER	Five years.	RPI – X with separate revenue caps for transmission and distribution.	A number of cost items considered to be largely outside the control of	There is no specific provision for the price control in general to be re-opened. The regulator would have to set aside the current control and undertake a new

Sector; Regulator	Length of control	Form of control	Use of pass-through	Type of re-opener
			the company can be passed through in whole or in part.	review. Such a decision would be subject to a potential judicial review.
Gas transmission; France; CRE	Four years for GRTgaz and two years for TIGF.	Incentive based regulation for opex, but with customers receiving the benefits of efficiency savings in subsequent price control periods, and a number of costs being subject to pass-through arrangements. Regulation of capex appears to be a form of rate of return regulation.	Full and partial pass-throughs are allowed for some cost items and in relation to under and over recoveries of revenue.	There appears to be an ability to re-open the control for GRTgaz after two years, but the precise circumstances in which this can happen and the form of the review are unclear.
US:				
Electricity and Gas; New York state; NYPSC	Ten years.	Earnings Sharing Mechanism, with a defined acceptable target for Return on Equity.	All electricity and gas commodity costs may be recovered from customers.	If cumulative earnings over the first four years exceed 11.75%, in addition to the sharing of benefits, a re-opener can be triggered. Prices are then to be adjusted by 50% of the annualised amount of excess earnings. Only one re-opener is allowed throughout the price control period.
Electricity; Mississippi state; MPSC	Annual.	Regulated return on investment, with performance based component.	No specific pass-through, aside from an annual true-up of returns, which is capped at 4% of annual revenues.	In the case of Major Plant Additions, the company is allowed to file for additional rate changes outside of the prescribed regime. Otherwise, reopener only permitted for *force majeure* events that raise costs or reduce revenues to an extent that cannot be recouped through the regime.
Australia:				
Water & sewerage; New South Wales; IPART	Four years.	CPI ± X with separate price caps for water, sewerage and auxiliary services. For water, this is made up of a usage charge and a service	Pass-through to service charge allowed for Sydney Catchment Authority's (SCA) bulk	No specific mention but the last price review took place ahead of schedule as a result of a substantial change in circumstances.

Sector; Regulator	Length of control	Form of control	Use of pass-through	Type of re-opener
		charge.	water prices.	
Electricity distribution; Victoria; ESC	Five years.	CPI – X + S (where S is a service adjustment incentive) with prices controlled under a weighted average tariff basket approach for each distribution company.	Pass through of costs (or savings) permitted relating to: changes in taxation policy; financial failure of a retailer; a declared retailer of last resort event; and/ or "major project" events (one per control period).	None specified.

Table A3.2: Treatment of Capex

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
UK:				
Electricity; Ofgem	Transmission – Review of company business plans, with some use of unit cost benchmarking. Distribution – Review of company business plans to set baseline for IQI menu. Companies choose position on the IQI menu.	Core capex is subject to overall RPI-X incentive, with a rolling five year retention of efficiency benefits. Revenue drivers are used for larger projects and projects where demand is uncertain. IQI menu approach provides an incentive for accurate capex forecasting together with an incentive to make efficiency savings.	There is limited *ex post* scrutiny of transmission capex, which partly reflects that much of it will be demand led, e.g. reinforcement in response to new connections. The premise of the IQI menu approach is that *ex post* scrutiny should not be required. However, Ofgem has not ruled out the use of *ex post* scrutiny.	
Gas; Ofgem	Transmission – Review of company business plans, with some use of unit cost benchmarking. Distribution – Review of company business plans to set baseline for IQI menu. Companies choose position on the IQI menu.	Core capex is subject to overall RPI-X incentive, with a rolling five year retention of efficiency benefits. Revenue drivers are used for larger projects and projects where demand is uncertain. IQI menu approach provides an incentive for accurate capex forecasting together with an incentive to make efficiency savings.	As customer demand needs to be demonstrated for most transmission capex *ex ante*, there is limited need for *ex post* scrutiny. The premise of the IQI menu approach is that *ex post* scrutiny should not be required. However, Ofgem has not ruled out the use of *ex post* scrutiny.	Capex to replace iron mains on the gas distribution network for safety reasons has been partly expensed.
Water & sewerage; Ofwat	Determined *ex ante* based on company estimates and	Unanticipated savings are kept by the company for five	None.	Depreciation is handled through an accounting and

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
	justified on the basis of cost benefit analysis, subject to a review and adjustment for efficiency gains by the regulator.	years in a rolling system. Overspend is excluded. Plan to move to menu system with symmetry as part of the ongoing price review (PR09).		price control charge associated with non-infrastructure assets. It is set mechanically, based on existing and new asset values and lives, but subject to a "broad equivalence" check which limits the extent to which depreciation may exceed non-infrastructure capital maintenance spend.
Post; PostComm	Determined *ex ante* based primarily on a bottom-up assessment of specific plans put forward by the company.	Unanticipated savings are kept for the remainder of the price control period. Overspend, unless captured in the specific controls for specific incentives or re-opener, is excluded.	The policy has not been articulated.	None.
Airports; CAA	Determined *ex ante* through "Constructive Engagement" between stakeholders, as well as being subject to efficiency reviews by the regulator.	Underspend and efficient overspend are reflected in the roll forward of the RAB at the following price review. Triggers are used for major capex projects.	*Ex post* evaluation of efficiency and the degree of consultation with users prior to the undertaking of capital expenditure projects, which then determines the extent to which it can be added to the RAB at the next price review.	Price control includes a "wash up" mechanism for out-turn capital expenditure in the final year of the previous control period. The company receives forecast depreciation irrespective of actual capex.
Rail; ORR	Determined *ex ante* based on company estimates, subject to a review and adjustment for efficiency gains by the regulator.	Efficient overspend and efficient underspend are borne/retained for the remainder of the control period.	Subject to efficiency evaluation, capex is rolled forward in RAB according to: amount of over/underspend + associated capitalised	Amortisation is based on the average annual long-run steady state expenditure on renewals, which was set by the regulator and takes account of

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
			financing from the year in which it occurred – 25% of the amount.	the scope for future catch-up efficiency improvement.
Europe:				
Gas transmission and distribution; Ireland; CER	Determined *ex ante* based on a bottom-up review of the company's business plan and proposed capex. Some reference is made to international and functional benchmarking.	Underspend and efficient overspend are reflected in the roll forward of the RAB at the following price review.	Capex overspend is subject to an *ex post* efficiency evaluation.	Most new transmission investments require the prior approval of the regulator even if an allowance has been made for the investment in the price control. This process gives substantial assurance to the company that such investments will be included in the RAB. A trigger has been included to allow revenue when the Corrib gas field is operational and the relevant pipeline is utilised.
Gas transmission; France; CRE	Determined *ex ante* based on company estimates, subject to a review and adjustment for efficiency gains by the regulator. Includes pre-funding of assets during the planning phase of major projects.	Unanticipated savings are kept for the remainder of the price control period. The company receives a 3% uplift on cost of capital for 10 years for all investments that increase capacity on the network and/or reduce the number of balancing zones.	None.	None.
US:				

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
Electricity and Gas; New York state; NYPSC	N/A.	N/A.	N/A.	Costs are amortised unevenly over ten years with larger amounts being amortised in latter years (consistent with projected recovery through rates).
Electricity; Mississippi state; MPSC	Projected capex is included in the company's annual calculation of a forward looking return on investment for the coming year. This Projected Retail Return on Investment is then compared to a Range of No Change, which is a range of rates based on the company's cost of capital and a performance element. If the PRRI is within the RNC, then no change in revenue is made, but if it is materially outside the RNC, revenue adjustments are made until an appropriate (projected) return is achieved. Changes are capped at 4% of the company's annual revenues.	None.	After each Review Period, there is a retrospective calculation of actual Earned Return on Investment, which is compared to the RNC projected for that year. To the extent that the EROI is outside the RNC, an adjustment to rates is made in the next billing cycle. Any retrospective adjustment is also capped at a 4% change of annual revenues.	The regime is not designed to accommodate "Major Plant Additions". If these are required, the company is allowed to file for additional rate changes outside of the prescribed regime. These will be considered by the regulator on an *ad hoc* basis.
Australia:				
Water & sewerage; New South Wales; IPART	Determined *ex ante* based on company estimates, subject to a review and adjustment for	Unanticipated savings are kept for the remainder of the price control period.	None.	None.

Sector; Regulator	Determination of level	Incentive	*Ex post* treatment	Any other adjustments
	efficiency gains by the regulator.	Overspend, unless captured in specific controls for specific incentives, is excluded.		
Electricity distribution; Victoria; ESC	Regulator set capex level for each company based on a 30% increase from capex incurred in the previous control period.	The Efficiency Carryover Mechanism (ECM) is a "roller" mechanism whereby efficiency gains from opex/ capex underspend are retained for 5 years (irrespective of when they are earned). Capex will not be included in the ECM that applies beyond the current control period.	None.	None.

Table A3.3: Incentives

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
UK:				
Electricity; Ofgem	Transmission – Asymmetric. Although precise approach to consider overspends will be decided on a case by case basis. Distribution – Symmetric under IQI menu.	Unanticipated savings are kept by the company for five years in a rolling system. No provision for overspend other than for pre-specified re-openers. There are specific incentive schemes, generally with caps, collars and sharing factors for some items, such as system operator costs.	A combination of revenue adjustments and direct compensation payments to suppliers and customers. Liability for payments is generally capped.	Usually a limitation on downside exposure for the company, but increasingly symmetric.
Gas; Ofgem	Transmission – Asymmetric. Although precise approach to consider overspends will be decided on a case by case basis. Distribution – Symmetric under IQI menu.	Unanticipated savings are kept by the company for five years in a rolling system. No provision for overspend other than for pre-specified re-openers. There are specific incentive schemes, generally with caps, collars and sharing factors for some items, such as system operator costs.	A combination of revenue adjustments and direct compensation payments to suppliers and customers. Liability for payments is generally capped.	Usually a limitation on downside exposure for the company, but increasingly symmetric.
Water & sewerage; Ofwat	Asymmetric. Proceeds from sale of operational land are shared 50:50.	Unanticipated savings are kept by the company for five years in a rolling system. Overspend is excluded.	Minor adjustment to prices for overall performance on service delivery (customer service, drinking water and environmental performance). Potentially significant penalties for service failure, e.g. on leakage or customer service. These are	Asymmetric.

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
			not automatic but subject to review by the regulator and discretionary determination of the level of penalty.	
Post; PostComm	Asymmetric.	Unanticipated savings are kept for the remainder of the price control period. Overspend, unless captured in the specific controls for specific incentives or re-opener, is excluded.	Up to 5% of Royal Mail's revenue is subject to performance against reliability targets for its retail products. Each percentage point below the target leads to a percentage point reduction in revenue for that product. For business customers the reduction in revenue is paid directly to the customers as a rebate, while for social customers (those using public tariff products), the reduction in revenue comes through in prices in subsequent years. The regulator can (and has) imposed fines for performance below the five percentage point threshold.	Asymmetric. Royal Mail bears volume risk.
Airports; CAA	Approaching symmetry.	Underspend and efficient overspend are kept for the remainder of the price control periiod.	Financial incentive against a basket of service quality measures, with a maximum bonus of 2.24% and a maximum rebate of 7% of each airport's annual charge revenue. Triggers for reaching pre-specified milestones in selected	Asymmetric.

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
			capital investment projects.	
Rail; ORR	Symmetric.	Efficient overspend and efficient underspend are borne/retained for the remainder of the control period.	Schedule 8 requires the network operator to pay service operators if it fails to meet a condition on the number of delays. This condition is symmetric in that if the targeted is bettered in a given year, the service operator is required to pay the network operator. Schedule 4 requires the network operator to compensate service operators for temporarily restricting access to stretches of track to allow for engineering work to be done. A volume incentive allows for a lump sum payment at the start of the next control period if the network operator accommodates growth in traffic beyond the projections set in the price review.	Asymmetric.
Europe:				
Gas transmission and distribution; Ireland; CER	Approaching symmetry.	Unanticipated savings are kept for the remainder of the price control period. Overspend is excluded.	None.	Approaching symmetry.
Gas transmission; France; CRE	Approaching symmetry.	50:50 sharing of any efficiency gains achieved over the price	Some aspects of performance are subject to a financial incentive	Asymmetric.

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
		control period, which customers receive in the next price control period.	around certain levels of performance.	
US:				
Electricity and Gas; New York state; NYPSC	The electricity regime is relatively complex, including risk mitigation clauses for both investors and customers. The profile of revenue sharing is defined around a central threshold Return on Equity of 10.6%. Specifically: • any additional earnings up to 11.75% can be retained by the company (extended to 12.0% if certain customer migration and education goals are met); • earnings between 11.75% (or 12%) and 14% are shared equally with customers; • returns above 14% shared 75% with customers and returns above 16% shared 90% by customers; and • after the fourth year of	None.	Penalties with total annual pre-tax value of $24 million may be applied if satisfactory service levels are not met. If penalties exceed $7.5 million in any year, these are credited to customers (with lesser penalties entering a deferral account).	None.

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
	the plan, a cumulative assessment of the returns is made, with 50% of any excess return returned to customers. The gas regime is simpler with equal sharing between shareholders and customers beyond the defined "deadband".			
Electricity; Mississippi state; MPSC	Symmetric.	None.	Service performance is measured and incentivised through two components of the Company's Performance Rating: • Customer Service Reliability is calculated as an index that comprises number of customer interruptions exceeding 5 minutes, and the duration of those interruptions. Only interruptions. • Customer Satisfaction is measured through bi-annual customer surveys, using five questions specified by the regulator.	Symmetric.
Australia:				

Sector; Regulator	Degree of sharing	Opex	Service performance	Overall incentives
Water & sewerage; New South Wales; IPART	Asymmetric.	Unanticipated savings are kept for the remainder of the price control period. Overspend, unless captured in specific controls for specific incentives, is excluded.	A set of specific output targets for water and wastewater services.	Asymmetric.
Electricity distribution; Victoria; ESC	All efficiency gains within control period retained by companies. Customers benefit from (P_0 and annual) price reductions at subsequent controls.	Efficiency gains from opex underspend are retained for 5 years (irrespective of when they are earned) under the Efficiency Carryover Mechanism.	Two service incentive mechanisms apply: • Service Incentive Scheme: a company's allowed revenue is increased (decreased) based on increases (decreases) in service performance as measured against defined targets. • Guaranteed Service Level: customers who receive a level of service that is worse than defined levels receive automatic payments directly from the distribution companies. An allowance has been made in the revenue requirements of each company to meet a level of GSL payments for the current control period.	?