Pipes and Wires

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executive summary

1 Pipes and wire networks provide households and commerce with the essentials of modern life - electricity, gas, telecommunications, water and sewerage services **(see Figure 1)**. The networks provide a high and reliable standard of service, but running them is a technically complex and costly undertaking, amounting to some £20 billion a year. In these networks, there is less scope for the competition that has been introduced into many other parts of the utility industries. Successive Governments have therefore established and maintained a system of economic regulation to protect consumer interests. The Office of Water Services (OFWAT), the Office of Gas and Electricity Markets (OFGEM) and the Office of Telecommunications (OFTEL) are responsible, respectively, for water and sewerage services, energy and telecommunications. In the absence of effective competition for the provision of network services, each of these regulators has introduced price controls using an output-based price-capping approach known as RPI - X, which prevents regulated companies from raising prices by more than general price inflation less a given percentage factor (X)[1].

1 The pipe and wire networks

Industry	Services	Companies owning and operating network assets	Customers
Telecommunications	Voice and data services transmitted through a network from sender to receiver	Several companies, with British Telecommunications (BT) being the main regulated entity	Telecommunications companies offering retail services to households and businesses
Electricity transmission	Transmission of electricity from power stations to the distribution networks	National Grid Company (England and Wales)	Other electricity companies; a few very large industrial users
Electricity distribution	Distribution of electricity to households and business premises	12 regional electricity distribution companies (England and Wales)	Companies supplying electricity to homes and businesses
Water and sewerage	Conveyance of clean water to homes and businesses and removal of waste water	10 water and sewerage companies and 13 water only companies in England and Wales	Consumers of water and sewerage services (both households and businesses)
Gas network	Bulk transmission and distribution of gas from where it reaches land to customers	Transco (formerly part of British Gas)	Shippers of gas, who buy gas at the shore or other entry points and sell it to suppliers at the customer's meter

Source: National Audit Office

1 *In the water industry, the approach is technically described as RPI +/- K to reflect the heavy investment programmes that the industry has had to deliver since 1990. Throughout this report, we refer to RPI - X as a general term to describe the incentive-based regulation schemes used by regulators, including by OFWAT.*

2 This report examines why regulators have developed the RPI - X approach (Part 1), considers how the work of regulators has benefited consumers (Part 2) and how regulators have sought to address the risks arising from the approach (Part 3)[2]. The report focuses on price reviews for the water and electricity industries in England and Wales and telecommunications in the whole of the United Kingdom and we have sought to draw lessons of wider relevance to economic regulation[3].

Main findings: the successes and potential limitations of the RPI - X process

3 In the absence of effective competition, regulation may be needed to protect consumers. The main challenge facing regulators is to create incentives for monopoly companies to deliver effective and efficient networks, but without creating distorted or unintended incentives, or imposing excessive burdens on regulated companies. There is evidence that the way that regulators have used RPI - X has been successful in achieving these objectives. Our analysis shows that customers have seen lower prices and higher quality of service, and regulated companies have been able to cut costs and invest in their networks, while continuing to finance their functions. While the form of RPI - X has been successful to date, limitations inherent in the approach mean that there are risks to the continued achievement of the regulators' objectives. This report considers these limitations alongside the actions that the regulators have taken to mitigate the consequent risks. **Figure 2** summarises our analysis.

2 Potential risks arising from limitations in the RPI - X approach

A The strength of incentives

Incentives to find efficiency savings may be weaker toward the end of price control periods

B Investment in networks

i) RPI - X may distort incentives relating to investment

ii) The regulators may make decisions on the level of investment on the basis of inadequate information

C Financing investment

i) Regulators may allow insufficient or excessive returns to investors

ii) Investors may perceive the regulatory regime to be uncertain

D The process of RPI - X regulation

The process of price regulation may impose excessive demands on companies

Source: National Audit Office

2 *Our methodology is set out in Appendix 1.*

3 *We have also drawn lessons from gas and railway infrastructure price reviews where appropriate. The report's conclusions focus on the inherent risks in the prevailing approach and may therefore be applicable to other regulatory contexts using a similar price-capping approach. These include the water industry in Scotland, the electricity industry in Northern Ireland and Scotland and the postal and airport industries in the United Kingdom as a whole.*

The objectives of the regulators

4 Without some form of regulatory intervention there is a risk that companies in a monopoly or strongly dominant market position would be able to set excessive prices or to provide a lower quality of service. The duties of the regulators are set out in the specific Acts of Parliament relating to the privatisation or subsequent regulation of the industries concerned. The wording and precise ordering of the duties varies but they all require the regulators to protect the interests of consumers in respect of the availability, price and quality of service and to ensure that the regulated companies can finance their functions[4]. Since privatisation the UK regulators have adopted a common output-based approach, RPI - X, to capping the prices that pipe and wire monopoly companies can charge for delivering the service expected. RPI - X involves the regulator forming a judgement on the likely costs companies should incur to deliver expected outputs efficiently during the next five years (four in telecommunications) and setting prices to cover these costs according to a formula linked to the retail price index (RPI).

The consequences of RPI - X: incentives for companies, benefits for consumers

5 The strength of the RPI - X approach is that if companies can deliver the services at a lower cost than anticipated by the regulator, they keep the consequent additional profits until the regulator next reviews the price cap. These savings can then be passed on to consumers through lower prices or improved services in subsequent periods. RPI - X therefore provides strong incentives to improve efficiency for the ultimate benefit of customers, and also provides clear information to regulators on how companies can increase their efficiency over time. We found that these incentives for efficiency have been associated with substantial improvements in the efficiency of the network companies. In the periods up to the most recent price reviews the efficiency gains were of the order of 3 to 9 per cent a year. These gains followed similarly substantial gains earlier in the 1990s[5].

6 The reductions in the costs of the networks have not resulted in any significant reductions in the quality of service delivered to consumers, and many measures of quality have improved. Consumers have continued to receive these essential services, and published data has shown:

- reductions in interruptions to electricity supply since 1990;
- reductions in the number of water consumers subject to unplanned supply interruptions since 1990; and
- the percentage of successfully completed telephone calls has been maintained at a very high level.

4 The specific wording differs from case to case. For example, in the case of the Rail Regulator, the duty in this regard is to "act in which he considers will not render it unduly difficult…to finance any activities …in relation to which the Regulator has functions."

5 National Audit Office, The Work of the Directors General of Telecommunications, Gas Supply, Water Services and Electricity Supply (HC645, 1995-96). This found that, in real terms, prices had fallen by between 10% and 44% for domestic electricity, gas and telecommunications customers, and by between 9% and 54% for business customers.

7 Of the regulators, OFWAT have paid the greatest attention to promoting quality of service by network companies, by requiring them to supply each year independently validated figures against a wide range of indicators which OFWAT publish as a way of encouraging improvements in performance. These indicators have shown a generally rising trend. They have also used price reviews explicitly to improve outputs, resulting in substantial improvements in environmental and drinking water standards and in the security of water supplies (as shown for example by reductions in water leakage[6]). OFGEM have during 2001 made proposals for linking prices with specified quality measures in the electricity (and gas) distribution networks.

8 Regulators have sought to pass on efficiency gains to customers at their next review through lower prices or higher standards[7]. As a result of the most recent price reviews, consumers have in all cases benefited, mostly through price reductions, although OFWAT applied part of these gains to offset the costs of improving water quality. The impact on prices is set out in **Figure 3** which shows that, at the most recent price reviews, regulators introduced price cuts for customers of network companies ranging from 1.5 per cent per year in real terms (electricity transmission) to 13 per cent per year in real terms (telecommunications). In addition, regulators introduced immediate price cuts for the water (an average of 12.3 per cent in real terms) and electricity distribution (an average of 24 per cent in real terms) industries.

3 **Impact on prices of the regulators' most recent reviews**

Telecommunications: Following the 2001 review, BT's charges for some network services will fall by up to 13 per cent a year in real terms over the period. Services in markets that are prospectively competitive cannot increase by more than RPI + 0 per cent.

Electricity Transmission: The last electricity transmission price review resulted in caps on revenue that represent the equivalent (with stable volumes of electricity transmitted) of falls in transmission charges of 1.5 per cent each year in real terms.

Electricity Distribution: The last review cut distribution charges on average by 24 per cent in 2000-01, with further annual reductions of 3 per cent a year in real terms for each company.

Water and sewerage: In their 1999 review, OFWAT reduced average water company prices by 12.3 per cent in real terms 2000-01, and an average overall reduction of 2.1 per cent per year over the period 2000-2005.

Source: National Audit Office

6 *The report by the National Audit Office, Office of Water Services: Leakage and water efficiency (HC971, 1999-2000), found that there had been reductions in the amount of water leakage year on year from 1995.*

7 *The form of price cap can vary. In some industries, they involve limits on the prices companies can charge customers, while in others they represent caps on the revenues that a regulated company may earn.*

Risks to the strength of incentives

Incentives to find efficiency savings may be weaker toward the end of price control periods

9 Under RPI - X, regulated companies have an incentive to achieve efficiency gains because they can keep the benefits (in terms of higher profits) for either a fixed period of time or until the regulator next reviews prices and passes benefits back to customers. This can mean that, as the next review of prices approaches, the length of time for which companies enjoy the benefits of efficiency improvements diminishes. As a result, under RPI - X the incentives to find efficiency savings may be weaker toward the end of price control periods. Regulators can respond to this potential weakening in two ways: they can make roll-over provisions, or they can attempt to anticipate this effect when making their assessment of the future level of efficiently incurred costs.

4 The regulators' response to risks to the strength of incentives

- Regulators are increasingly allowing companies to keep the benefit of efficiencies for five years regardless of when the savings are realised, although only OFWAT have made such a 'roll-over' provision relating to all forms of expenditure.
- OFTEL prefer to deal with this issue by having a glide path rather than a one-off adjustment for prices and by basing their cost forecast on average annual changes in costs, along with an assessment of the extent to which costs currently exceed a benchmark level.

Risks to investment in networks

i) The regulators may make decisions on the level of investment on the basis of inadequate information

10 Asset management is an important expertise for the network companies. They use their knowledge of the capability and performance of their assets to ensure that they continue to deliver the outputs - in terms of reliable provision of electricity, water and telecommunications - required. They can also use this knowledge to deliver improvements in service. Regulators need to make a judgement in their price reviews on an appropriate level of expenditure on the assets, both to maintain asset performance and to deliver enhancements in quality. While they can obtain historic information on how much maintenance and renewal has cost, this does not tell them whether that investment was sufficient, and there are significant problems for both companies and regulators with obtaining information on future needs, as follows:

- pipe and wire networks have an underlying resilience and it could take some time for inadequate or inefficient expenditure on maintaining them to be reflected in declining performance against output measures, such as numbers of interruptions;
- links between expenditure and the quality of network performance are hard to identify; and
- in seeking to obtain information about appropriate levels of investment, regulators may become too involved in the detail of company investment plans.

11 There is no evidence that investment has been inadequate or that the networks have deteriorated. For example, investment in the networks has been high (over £31 billion since privatisation in gas and electricity, over £50 billion in water, and similar amounts in telecommunications) and all the regulators consider that the RPI - X regime is capable of incentivising even higher levels of investment. But some regulated companies consider that the most recent periodic reviews provided for less investment than they considered necessary to prevent existing assets deteriorating, and that there may be a need for more resilient and flexible networks in future. There are also indications that the level of investment may have to rise in future to deliver the outputs the public expect. For example, the Better Regulation Task Force has reported an expectation in the electricity sector of an increasing need for investment[8], while the Environmental Audit Committee has raised concerns about the level of investment in the water industry to manage and renew sewer and water mains[9].

ii) RPI - X may distort incentives relating to investment

12 Price reviews enable the regulators to form a judgement about what it should cost network companies to deliver the outputs expected of them, but there is a degree of uncertainty about the relationship between cost inputs and the outputs delivered by regulated companies. Furthermore companies may not always be sure that regulators will accept that additional investment is necessary. This perceived lack of certainty creates an unintended reason for companies to defer investment. To address these concerns, regulators have developed a process, with varying degrees of formality, for logging up investments made by companies for consideration at the next price review. In the water industry, companies can also in some circumstances apply for an interim determination of price limits. Our survey of companies shows that this issue is a serious concern to them and that they believe that some longer-term certainty was needed. In the case of OFGEM and OFWAT there is a further complication arising from the differing treatment of capital and operating expenditure which may produce an unintended reason for companies to substitute capital for operating expenditure.

5 The regulators' response to investment risks

The regulators are taking a range of initiatives including:

- improving the quality of information and the incentives for long term investment. For example, OFGEM's Information and Incentives Project is intended to link electricity distribution company prices to improved measures of service performance, and OFWAT have collected similar information since 1990;
- encouraging companies to adopt a risk management approach to their network assets. For example, OFWAT's recent paper on Maintaining Serviceability and OFGEM's paper on asset risk management assessments propose frameworks for companies to assess more rigorously the investment needed to maintain their networks in a way that satisfies the regulators[10]; and
- focusing on the outputs required from the networks.

8 *Better Regulation Task Force, Economic Regulators (July 2001), paragraph 6.2. The Government's response to this report was published in February 2002.*

9 *Environmental Audit Committee, Water Prices and the Environment - Seventh Report, 1999-00 (HC597, 1999-00), paragraph 208.*

10 *OFWAT, MD161: Maintaining Serviceability to Customers (12 April 2000); OFGEM, Enhancing Asset Risk Management Standards in Gas and Electricity Network (8 November 2001).*

Risks to financing investment

i) Regulators may allow insufficient or excessive returns to investors

13 The statutory duties of regulators include a requirement to ensure that companies can finance their functions. In determining price limits for companies, they seek to meet this duty by allowing for a return on capital to reward investors. This allowance can be a large part of the costs estimated by regulators and hence of price limits. For example, the returns allowed in the water and electricity transmission industries amount to around one third of the total price paid by customers. Estimating an excessive return entails customers paying unnecessary costs, while estimating too low a return may discourage investors from providing funds to regulated companies, thus potentially making it difficult for companies to meet their obligations.

14 The regulators recognise that there is inevitably an element of judgement in their approach. But as the regulators have to include a precise figure in their calculations, there is always a significant risk arising from the possibility that the figure they estimate appears to observers to be either too high or too low. There have in particular been concerns expressed by some water companies that this risk has crystallised in the water industry, by allowing for too low a return in the last review. But OFWAT's view is that all companies have continued to finance their functions, that their assumptions were broadly consistent with those of other regulators and that companies dissatisfied with their price limits can require the regulators' decisions to be referred to the Competition Commission[11]. And they point out that, since the review, some companies have successfully responded to the incentives within RPI - X to achieve more efficient financing costs by becoming predominantly debt rather than equity financed. OFWAT continue to monitor these developments to ensure that changes to a company's financial structure do not transfer risks currently borne by the company's owners to consumers.

ii) Investors may perceive the regulatory regime to be uncertain

15 It is inherent in the RPI - X approach that the certainty during the period after a review comes in exchange for the regulators having considerable discretion in how they determine prices and outputs at the next review. Investors are aware that changes made at reviews can substantially impact on profitability and hence their returns. This may create a perception of uncertainty in the minds of investors and hence increase the returns investors demand to finance new investment. Despite this perception of uncertainty, however, there have been few major changes in the overall RPI - X approach during the most recent price reviews. But companies in all industries told us that they had concerns about some elements of the methodology to be adopted by regulators in future. For instance, there were concerns as to whether investment undertaken during the period would be allowed in future price caps or whether changes would be made to the methodology for calculating allowed capital expenditure or returns on investment.

11 In the case of OFWAT's 1999 price review, two companies required the licence amendments introducing new price limits to be referred to the Competition Commission.

6 The regulators' response to the risks to financing investment

The regulators are responding by seeking to improve the transparency and replicability of their price review work through:

- explaining more clearly to companies and investors the assumptions lying behind their calculations;
- seeking to communicate to companies and investors the methodologies they intend to use in future reviews; and
- considering, and in the case of OFWAT, committing to, the sharing of the financial models on which they base their calculations, so that companies and others can replicate their calculations.

Risks arising from the process of RPI - X regulation

The process of price regulation may impose excessive demands on companies

16 Even though the price review process produces substantial benefits for customers, it is not without costs for both regulators and companies. We have estimated that, on the basis of costs recorded by the regulators themselves, and responses to the survey we issued to regulated companies, the costs of the price reviews we have examined in detail for regulators amount to some £10 million (for four price reviews), and for each company a significant level of costs, which can in some instances exceed £1 million. These costs should be set against the benefits of the review process described above.

17 The regulated companies told us that it was not clear to them how much of the information they supplied to regulators had in fact been used. For example, a common concern across all regulated companies was that the detailed projections of future expenditure they provided were largely ignored. The regulators consider that they used all the information provided and had to spend considerable time verifying and confirming it, but that their conclusion had been to treat the projections with scepticism. This example serves to illustrate the risk that the RPI - X process imposes a large information burden on both regulators and companies. Regulators can reduce information burdens by collecting and verifying more information between reviews, for instance by using regulatory accounts provided by companies, although this may require changes in the format for some of these accounts.

7 The regulators' response to the risks arising from the process of RPI - X regulation

The regulators are:

- examining how to reduce the volume of information they request from companies;
- seeking to consult widely on their proposed price control approaches to help companies and others understand the purposes for which regulators request information;
- seeking to demonstrate how they use information they receive, through the use of clearer audit trails; and
- seeking to reduce the number of information requests and to rely to a greater extent on annual information returns and to revise the format of regulatory accounts to make them more useful (although it is inevitable that the forward-looking price review process will require some new information, principally projections for future periods).

Conclusions and recommendations

18 Through their regulation of network prices, OFGEM, OFTEL and OFWAT have been successful in ensuring that the networks are maintained and enhanced and in encouraging substantial improvements in efficiency which have been passed on to customers. The RPI - X approach does, however, have some inherent limitations (Figure 2). The regulators have already started to consider how they will conduct the next round of price reviews, and the following recommendations are aimed at helping the regulators to develop their existing practices so as to continue to mitigate the risks arising from these limitations.

A. Risks to the strength of incentives:

I **The regulators should seek to remove features of their price reviews that give companies an incentive to bias their decision making or accounting to obtain more favourable treatment.** Under the standard model of RPI - X, the length of time for which companies can benefit from out-performance of the regulatory assumptions about efficiency savings varies according to when the savings are made, which may lead companies to time their achievement of efficiencies according to a regulatory timetable (and not according to commercial or economic considerations). Similarly the differing treatment by OFGEM and OFWAT of operating and capital expenditure creates a risk that companies bias their planning, decision making or accounting to obtain a more favourable outcome. It is undesirable that the price review mechanism should risk influencing company behaviour in these ways. OFWAT already allow companies to keep all efficiency savings for five years, while OFGEM have allowed distribution companies to retain some types of efficiency saving in this way. OFTEL do not consider that there has been sufficient evidence of this weaker incentive to warrant such a change. OFGEM and OFWAT are also considering how to minimise the risks arising from different treatment of operating and capital expenditure.

B. Risks to investment in networks:

II **The regulators should consider publicly identifying the improvements in outputs and outcomes that they are willing to allow companies to invest in.** Companies are required to deliver outputs, such as the reliable delivery of water and electricity to consumers, which are explicit or implicit in government policy, legislation and the companies' licences. The companies have discretion over the inputs used to meet these outputs. But in setting price caps which enable efficient companies to finance their obligations, the regulators cannot avoid making assumptions about the outputs which are expected and the costs of delivering those outputs. To enable companies to plan and initiate investment projects effectively, regulators should provide clear guidance on developments in networks to meet changing circumstances or deliver better performance and the preferred balance between quality of service and price levels. Such statements should draw on the requirements of Government and other regulators, dialogue with regulated companies, and the preferences of the public; and they should be produced sufficiently ahead of each price review to facilitate coherent investment planning. All the regulators we examined have addressed this issue by setting out broad quality objectives, establishing clear methodologies for their assessment of company investment plans, and in some cases developing incentives to reward quality improvement. The provision of clear guidance and statements by regulators in this area could further enhance the effectiveness of regulation.

III **The regulators should encourage network companies to develop risk management models to assess the potential impact of deterioration in asset performance on future levels of service.** While regulators obtain some measures of asset condition to support their price reviews, these do not tell the regulator what assets companies ought to replace in order to deliver the performance expected of them. The network companies are best placed to make this assessment. Such an assessment is needed to obtain a view of the investment required to maintain asset condition, especially if companies are to be able to justify the forward investment referred to in the previous recommendation by reference to outputs and outcomes. The regulators should be able to place some reliance on these models to reduce the amount of work needed during price reviews and to place the responsibility for securing the longer term condition of networks clearly with the companies themselves.

C. Risks associated with financing investment:

IV **The cost of capital allowance should be set in a way that transparently and consistently reflects the returns investors expect from investing in the companies concerned, assuming that they are efficiently operated.** Prices and the willingness of investors to finance investment are sensitive to regulatory assumptions on cost of capital, which is an inherently unverifiable forecast, and the assumptions underlying which vary from review to review. Together, the regulators intend to commission research into the cost of capital issues across the regulated industries. The regulators should take this opportunity to develop further consistency, taking account of relevant differences between industries, which reflects research into what returns investors actually expect and the impact that heavy demand for finance for new investment may have on these returns.

V **The regulators should present clearly the assumptions and financial models underlying their price review decisions and the extent to which these will apply at the next review.** The potentially costly perception of uncertainty in the price review process is aggravated if companies and investors do not understand precisely why regulators made their decisions and how they intend to conduct future reviews. The regulators' decisions are in practice based on the application of well established assumptions which need change little between reviews; but this has not prevented a perception of uncertainty, indicating the need for better communication with key stakeholders. To tackle the perception of uncertainty regulators should share the financial models they use to calculate price controls, and set out the principles on which future reviews will be based. OFWAT have already committed to do this.

D. Risks associated with the process of RPI - X regulation:

VI **The regulators should specify clearly and well in advance what information they will need from companies during price reviews and gather as much of the information as is cost-justified on an annual basis.** All regulators we examined have sought to set out their information requirements clearly and in advance of their price reviews. And yet the strong perception among regulated companies is that regulators have asked for unnecessary information. This implies that regulators have not communicated clearly enough why they need the information and how they have used it. The regulators' review of regulatory accounts provides a good opportunity to even out the burden of information collection and gives the regulators more time to verify and hence rely on the information they receive. The aim should be for companies to acknowledge after the next review that they knew well in advance what information they would need to supply and why it was needed.

VII **The regulators should publish an evaluation of their completed price reviews, and in doing so should evaluate the different types of analysis undertaken to determine whether some would not in future justify the cost to both regulators and companies.** As the regulated networks settle down after privatisation an increasing number of components of price reviews can be expected to be decided with sufficient accuracy without detailed analysis, bearing in mind that forecasts of future performance are inherently inexact in any case. By simplifying the price review process to elements of substantial importance to customers, the regulators ought in future to be able to reduce the costs of the process and concentrate on what really matters. The review conducted by OFWAT after their 1999 review, which they placed in the public domain, provides a useful precedent and the regulators' joint working groups may also be able to play a role in this evaluation.