Section 2
Methodology

Section 2: Chapter 2
Methodology: Introduction

a) Introduction

In this section I describe in detail the methodology that underpins this, my first full Strategic Review of Charges. My office has been preparing for this first full Review since its establishment in November 1999. The methodology is, I believe, very robust and needs to be outlined in some detail. Some elements of the methodology are very technical and are not essential to a high level understanding of the recommendations of the Review. Some readers may therefore wish to read this section selectively.

This Section comprises nine chapters, covering all of the major work areas that have informed my Review.

Chapter 3 describes the collection of information. The single largest component of this was the Information Project, which I initiated following the welcome by the then Minister for Transport and the Environment of my recommendation for consistent management information in the interim Review. This is followed by Chapter 4, which outlines a number of the other sources of information that were an important input into my Review. This chapter also includes a brief overview of the techniques used by other regulators.

Chapters 5 to 9 then discuss in some detail the methodology behind my calculation of efficiency targets and merger savings; and how I assessed customer needs and the issues surrounding competition.

Chapter 10 discusses the financial model and my risk analysis.

The first major task was to define the major issues to be analysed and compile a work plan, which ensured that each issue was analysed in detail and took into account all of the relevant factors. This work plan is described below.

b) Work plan

My initial focus was on the customer, as I wished to ensure that I had a full understanding of the priorities of the customer. I therefore developed a plan, which comprised both a quantitative and a qualitative element. My plan was to establish a process of consultation that was both extensive and in-depth. I put in place a consultation process with each of the broad segments of customers. This included a large user group, organisations representing the non-domestic sector and, of course, my Consultative Committees. This qualitative information was supported by questionnaires sent to non-domestic customers. I also established a customer panel to track, quantitatively, the views of domestic customers.

The second major area of focus was to understand the costs incurred by each of the three authorities and the potential for savings. To that end, I planned to use the privatised companies in England and Wales as benchmarks to allow me to set both capital investment and operating cost efficiency targets.

The third principal issue was the potential impact of competition. The plan was to understand what had happened to date in the water industry, why it had happened and the likely effective response. I also reviewed the development of competition in other utilities in order to understand what lessons could be learned about potential future developments in the water sector.

I then identified and investigated a number of organisational and governance issues, which I believed could be important to my Review. These included incentives and opportunities to profit from new business.

I pursued these work areas separately, although there were frequent interactions between the small teams responsible for each area.

I have consulted as extensively as possible with a range of organisations to understand either the impact of our conclusions or to test the validity of my logic. The next chapter discusses in some detail the development of my information project. This led to the creation of a regulatory database, which allows me effectively to compare, and to monitor the progress of, the water industry in Scotland.

Section 2: Chapter 3
Methodology: Collection of Information

a) Information Project

i) Background

In my interim Strategic Review of Charges, I signalled my intention to establish a mechanism to ensure that it would be possible to carry out rigorous comparisons between the water authorities and between the industry in Scotland and in England and Wales. This initiative was welcomed by the then Minister for Transport and the Environment. I recruited a consortium of firms to work jointly with members of my staff to assist in this initiative. The tendering process followed European procurement rules. The consortium brought in a range of engineering, strategic asset management, IT and financial modelling expertise. I believe that the consortium provided a wide range of practical experience both of regulation and of the operation of a utility business, and was therefore exceptionally well qualified to assist me in this important initiative.

My Information Project has created a database of asset, customer and financial information for each of the current water authorities. Each data point is clearly defined and, as a result, the information from each authority should be consistent and comparable. The definitions are fully consistent with those in the annual return provided by the privatised companies to Ofwat. The regulatory return ensures that the level of transparency in performance is much improved. This transparency has led directly to the capital, operating and merger efficiency targets that I set out later. It has also led me to conclude that the interests of all customers are best served by the move to a single water authority.

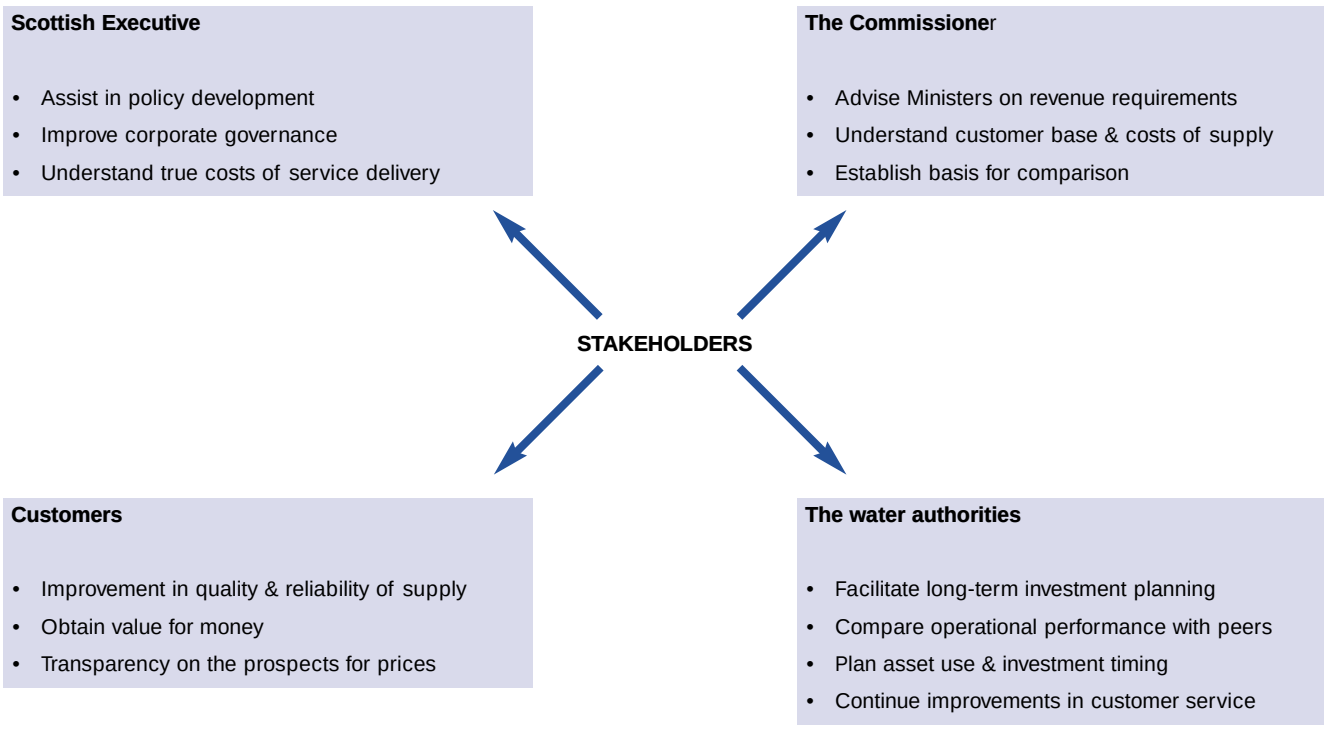
I believe that this initiative ensures that my office can robustly promote the interests of customers.

ii) Approach

There were three companies in the consortium. Cap Gemini Ernst & Young provided expertise in database development and project management. Yorkshire Electricity shared its best practice utility asset management knowledge and WS Atkins added its water industry knowledge. WS Atkins is also a Reporter for Ofwat and therefore has a detailed understanding of the regulatory process.

My approach to the Information Project was to ensure collaboration between the consultants, my staff and the water authorities. I believe that the water authorities had to understand both the reasons for the Information Project and how this

Figure 3.1: Key stakeholders of the Information Project and their objectives



information could be useful to them in delivering services to customers. Initially two rounds of interviews were held with key staff in each authority. These were designed to develop an initial opinion of the information available within the water authorities.

The Information Project addressed the needs of four key stakeholder groups, shown in Figure 3.1.

iii) Project deliverables

The five main outputs that the Information Project was required to deliver were to:

- determine the extent of the information to be collected for the regulator,
- generate agreed definitions,
- build a database to store the regulatory returns,
- define econometric models and processes,
- produce a financial model for the assessment of revenue needs.

These outputs were delivered in four phases over ten months.

Regulation depends to a critical extent upon the collection of information. The first phase of the project focused principally on the reporting formats to supply that information to my office. Specifically, the deliverables of phase one were as follows:

- A format for the annual return of data for regulatory purposes: this included cost allocations, performance measures, and customer information.
- A format for an asset inventory: this included asset condition, performance, risk profile and replacement cost.
- A capital cost base: this included the major categories of investment and allowed comparison with benchmark performance.
- An investment plan: this included all investment projects required by the Quality and Standards process and ensured that a forward view of the asset inventory was possible.
- A format for a Strategic Business Plan: this was to inform me as regulator about how the authorities saw their environment. My intention was that this should be analysed across five parameters: customers, competitors, costs, competencies[1] and compliance.

The second phase of the project set out to establish the current availability of the information required to complete the regulatory return. This assessment reviewed the availability of information regarding:

- customers,
- assets & physical resources,
- volumes of water supplied and sewage treated,
- explanatory factors,
- geographical breakdown,
- unit costs,
- investment projections,
- financial projections,
- project & output monitoring.

I asked the authorities to address any gaps in the requested information in Action Plans. I will discuss the conclusions of this phase of the Information Project in some detail later in this chapter.

The third phase of the project was designed to update the Ofwat econometric models and ensure that they adequately reflected the situation in Scotland. There were a number of issues that had to be addressed, namely:

- the impact of Public Private Partnerships (PPPs),
- comparative capital costs,
- comparative operating expenditure,
- comparative levels of service,
- type of asset base.

The fourth phase of the Information Project was the development of the actual database for storing the information provided in regulatory returns. The database had to meet a number of criteria:

- storage capacity to hold over ten years' data,
- flexibility to key in and update data values,
- ghost data facility (assumptions and/or predictions),
- report facility to output data in pre-defined format,
- audit trail of all data changes,
- compatible with any future licensing regime.

I also asked the consultants to review the financial model. I use this model for the calculation of the required revenue under a range of cost assumptions.

[1] Core skills and experience of the organisation.

iv) Annual return

The single most important output of the Information Project is the annual return. I wanted to be sure that I could benchmark costs with the privatised companies in England and Wales. I therefore asked the consultants to start with the equivalent information return used by Ofwat. This is the 'June Return'. This return consists of 38 tables that the companies must complete. It is a robust and detailed set of information on each area of the water and waste water business and all associated costs. Each line of information requested in each table has a precise definition. This is designed to ensure that all companies complete the tables in exactly the same way. Ofwat also collects other data from the companies. This includes the asset inventory and the 'cost base', which is used to assess capital unit costs.

I had to ensure that the 'June Return' format would be wholly applicable to Scotland. This necessitated certain changes to cover circumstances peculiar to Scotland (e.g. PPP costs).

My WIC Annual Return consists of 12 separate sections and comprises 97 tables, with over 20,000 items of data. The scope of each of the 12 sections is summarised below.

Section A – This records base information on population and properties connected to the water and waste water system. It also records the amount of water delivered by each authority and the volume of sewage treated.

Section B – This section contains the outputs to customers. In particular, it covers the availability of water to customers, details of supply interruptions, sewage flooding incidents, customer complaints and enquiries, and the performance of the water authorities in relation to their Guaranteed Minimum Standards schemes.

Section C – This section is concerned with quality and environmental outputs. It records details of the compliance of the authorities with water quality regulations; with waste water discharge consents for sewage treatment works; and with bathing water regulations. This section also looks at asset performance and is used to assist in the prioritising of capital maintenance expenditure to minimise the risk of non compliance.

Section D – This section records information on commissioned assets in the year for water, waste water and support services. The tables provide a summary of commissioned assets each year and provide the link between outputs and the related investment for both asset replacement and new or enhanced assets.

Section E – This section covers operating costs and efficiencies. It records details of activity-based costing for the water and waste water service; information on individual PPP schemes; water and waste water explanatory factors; sludge treatment and means of disposal; and employee numbers and costs. This data is used to analyse operating cost trends and to calculate unit costs.

Section F – This section focuses on the Statutory Accounts, for example, the income and expenditure account, the balance sheet and the cash flow statement.

Section G – This section summarises the authorities' investment plans for water, waste water and support services. This section enables the authorities to present their capital expenditure programme (at project level) showing the actual expenditure for the year and updated forecasts for future years. This allows comparisons with the planned expenditure defined in the Investment Plan for the period of the Review.

Section H – This section reports on the asset inventory and system performance. It covers details of asset age, condition and performance.

Section J – This section is concerned with cost base information. The cost base is a key information submission that is to be developed by the authorities in support of their investment projections. The cost base submission consists of a set of capital unit cost estimates for standardised projects (standard costs). These standard costs relate to work that has been or is likely to be undertaken by authorities as part of their future investment programmes.

Section K – This section reports on the authorities' Investment Plans for the future. It is the output from the Strategic Business Plan and the Quality and Standards processes. It should detail the capital investment needed to deliver the outputs and assets necessary to meet the business objectives defined in the Strategic Business Plan. It should also reflect the capital efficiency requirements agreed with me.

Section L – This section, like Section F, focuses on the Statutory Accounts. However, under resource accounting and budgeting

(RAB), accounts will be prepared under the modified historical cost accounting convention. Fixed assets, current asset investments in marketable securities, and stocks (where material) should therefore be shown at their current values.

Section S – This section provides a framework for preparation of a Strategic Business Plan by the authority in order to inform me of the strategic issues that the authority faces.

These tables and definitions are provided to each authority in an electronic format, which makes them easier to complete and to submit to me.

The scale of the information requirement is obviously large and varied, and it will take some time before all of the information is as accurate as either I or the water authorities would like. I have therefore adopted confidence grades, as Ofwat has done, in order that I can assess the information provided for reliability and accuracy. These grades are shown in Table 3.1.

Table 3.1: Information Project confidence grades

Reliability Band	Description
A	Sound textual records, procedures, investigations or analysis properly documented and recognised as the best method of assessment.
B	As A but with minor shortcomings. Examples include old assessment, some missing documentation, some reliance on unconfirmed reports, some use of extrapolation.
C	Extrapolation from limited sample for which Grade A or B data is available.
D	Unconfirmed verbal reports, cursory inspections or analysis.

Accuracy Band	Accuracy to or within +/–	but outside +/–
1	1%	
2	5%	1%
3	10%	5%
4	25%	10%
5	50%	25%
6	100%	50%
X	accuracy outside +/– 100 %, zero or small numbers or otherwise incompatible	

The confidence grade is a combination of the reliability and accuracy band, for example:

A2 Data based on sound records etc. (A, highly reliable) and estimated to be within +/- 5% (accuracy band 2);

C4 Data based on extrapolation from a limited sample (C, unreliable) and estimated to be within +/- 25% (accuracy band 4).

In addition, I have asked the authorities to provide a written commentary to each table detailing the source of their information and any assumptions made when completing the tables. In particular, I am keen to receive a detailed commentary where confidence grades are low.

In order to ensure that the quality of information that informs this Review is as good as possible, my office requested two 'dry run' annual returns. This gave the water authorities time to identify problem areas and improve the overall quality of their submission.

The 'dry run' returns suggested that considerable effort would be required in order to generate the data to inform accurately this Review. I received the first full annual return in June 2001. I am glad to report that there were substantial improvements in the information submitted to my office. However, there were still gaps and I had to clarify several points with the authorities. While not by any means perfect, I am now confident that the data that has been provided is sufficiently accurate and complete to inform this Strategic Review of Charges.

v) Application of annual return information

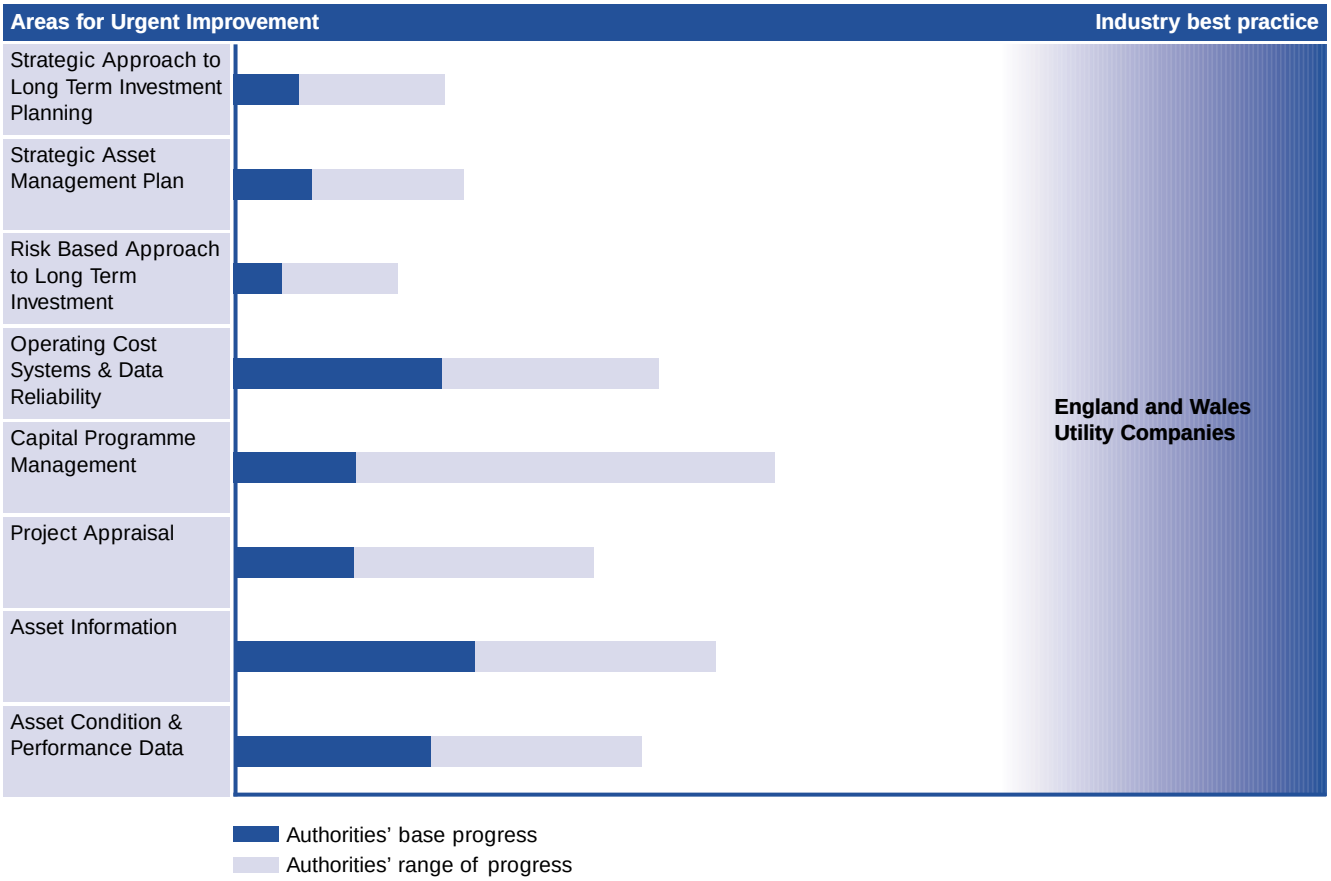
I use the data from my WIC Annual Return in a variety of analyses. For example, I calculate the operating efficiency targets based on information provided by each of the water authorities in Section E (operating costs) and Section A (base information).

I use the customer information from Section B for benchmarking purposes and to assess compliance with the Guaranteed Minimum Standards. The cost base data from Section J was central to my calculation of the capital efficiency target.

vi) Other key outputs

The project teams' initial meetings with the water authorities highlighted those gaps in information and in management

Figure 3.2: A view of the three authorities' position compared with industry best practice



processes that would impact on my annual information return. The authorities were compared with industry best practice across utilities in England and Wales. Where gaps were identified, I asked the authorities to prepare Action Plans to explain how they intended to address the gap and complete the WIC Annual Return.

The Action Plans span a period of four years. Some actions were short term (before April 2001), some are medium term (before April 2003) and others will take longer to address (before April 2005). The project teams identified those areas requiring urgent improvement based on the comparisons with industry best practice. Figure 3.2 is taken from their report.

The figure shows that the authorities fall considerably short of industry best practice, particularly in the areas of strategic long-term investment planning, strategic asset management and in adopting a risk-based approach to long-term investment.

I identified five areas for urgent improvement. The conclusions of the project teams are set out below, and I also outline whether the authorities addressed these issues in their Action Plans. The five priorities were as follows:

- Investment and business strategy: development of robust strategic asset management and long-term investment planning.
- Financial management and control: improved systems for investment appraisal, project monitoring and allocation of operating costs.
- Asset management: availability of accurate asset information, condition and performance grades and risk profile.
- Service delivery: measures of levels of service and quality outputs.
- Information management: improved systems for collection and storage of information concerning properties and populations served, volumes supplied and loads treated.

vii) Investment and business strategy

Strategic asset management is a key skill for the water industry in Scotland. This area is central to all decisions about asset investment, and has to be a priority for management. A robust strategic investment plan is essential to any business. The

project teams found that robust strategic plans, which linked the investment programme and the operating environment of the authority, were not in place.

The water authorities' Action Plans did not fully address the weaknesses in strategic planning. However, it is clear that each of the authorities understood the importance of this area and is taking steps to improve.

viii) Financial management and control

- Project appraisal - the project teams were concerned about the level of scrutiny and challenge given by the authorities to projects as they pass through the appraisal stage. They found that the appraisals did not take a sufficiently wide view of all of the factors impacting on projects. It was noted that this was due in large part to the lack of information about assets and detailed costs.

- Project monitoring – this is essential to the achievement of outputs to time and to budget. The project teams found that the authorities either have procedures in place which ensure that directors are informed of progress at programme level and of any problems at individual project level, or are putting these plans in place.

- Operating costs – the authorities have the systems to allow detailed allocation of costs. These have not yet been fully exploited but the authorities are actively assessing the feasibility of collecting costs at a process and water supply zone level.

The project teams recommended that I set out guidelines for investment appraisal. These are now complete and an audit of a representative sample of schemes is currently underway.

Early results from my investment appraisal audits show that the authorities do need to make significant progress. It is encouraging that each of the authorities delegated a senior manager to the audit team. Clearly, management do see this as a priority.

ix) Asset management: asset information

A full and detailed understanding of the asset base is critical. This will take some time to develop in full, and it is important to begin this process as soon as possible. The authorities will need to understand the condition, performance and risk of their assets at a detailed level. At the current time the definitions used by the authorities all differ slightly and their information is not complete. There is currently little information available at a detailed sub-asset level.

Understanding assets in this detail is essential to the planning of investment and to minimising operating costs.

The project teams recommended that:

- cost coding structures should be extended to provide sufficient disaggregation to meet regulatory requirements;
- risk-based techniques should be developed to assess risk levels for the assets the authorities operate or adopt;
- in the short-term, a suitable statistical methodology should be developed for filling gaps in asset data.

The authorities have defined a number of actions in their plans to improve the quality of their asset management. They have also agreed to introduce risk analysis to their investment appraisal.

The water authorities did not include in their Action Plans initiatives to improve their understanding in the area of asset condition and performance data. The authorities did, however, specify an asset project in the *European Journal* in March 2001. I believe that this project is a priority if we are to ensure proper management of the asset base.

x) Service delivery

- Output measures - the project teams found a mixed picture in this area. The authorities collect information on interruptions to supply, although there are some questions about the integrity and consistency of the information. The situation is much better in customer service outputs. The authorities are able to report on billing queries, complaints and telephone response times.

- Quality outputs - each authority is able to report statutory water quality compliance, but does not have direct access to SEPA information to report sewage compliance. The authorities are not currently able to assess risk of non-compliance for water treatment works on the basis described in my reporting requirements. A risk measure is,

however, needed to justify and target renewals expenditure. The risk of non-compliance at sewage treatment works is more difficult to establish. Neither SEPA nor the authorities monitor discharges at all sewage treatment works.

xi) Information management

- Information systems - the review disclosed that there are major gaps in the extent, consistency and quality of information required to run the business and for regulatory reporting. Problems have been encountered because of:

  - multiple legacy systems,
  - inconsistent definitions and references,
  - lack of business ownership of data leading to inadequate maintenance/update.

- Population and properties - domestic property total numbers are taken from local authority information. The quality of this data is not known. The water authorities are attempting to work with the local authorities to check the available information. All properties where the water authority is responsible for billing are classified as non-domestic. This will include some domestic premises that have a meter. The water authorities are at different stages in improving their customer information.

- Volumes and loadings – the water authorities need to understand the amount of water they produce and deliver to customers. Efforts have been made to understand water use by domestic customers and metered non-domestic volumes are available. There is no reliable information on water use by non-metered non-domestic customers. The water authorities do not collect information on the total amount of water put into supply. There is also no reliable information on the quantity and load of sewage volumes collected for either the domestic or non-domestic sectors.

The project teams recommended that:

- an Information Strategy is produced to provide the high-quality information essential to run the business;
- continued efforts should be made to improve the quality of the information relating to population and properties;
- significant work is required to improve the measurement of inputs and outputs to ensure accurate water balance information.

The three authorities have made considerable progress on improving their population and property information. However, they have made little progress on water balance information, although they have put plans in place to achieve a better understanding of water volumes.

xii) Information Project benefits

I believe that this initiative has been critical to the development of good quality regulation and my role in promoting the customer interest. I have been able to gain a good understanding of where the water authorities have to increase their knowledge. I hope that my information requirements will help them to run their business more efficiently. The Action Plans help me to make judgements based on the regulatory return.

I intend to continue to work with the authorities to increase the effectiveness of the Action Plans and to continue to improve the information available to management and for regulation.

The authorities have made considerable progress in improving the quality of their annual return information. The return, which was submitted in June 2001, was a marked improvement on the earlier dry runs. I do believe, however, that progress on asset quality information is required quickly in order properly to inform the next Quality and Standards process. This is urgent and the authorities cannot afford to delay.

The Information Project has been invaluable in ensuring that the information that I needed to complete this Review was available. The information has enabled thorough benchmarking and quality monitoring to be completed. My office is also now able to compare the data with Ofwat information on the English and Welsh companies.

The annual return has also been essential to the analysis of the potential for capital efficiency and the setting of appropriate targets.

b) Water Industry Commissioner letter process

In writing this Review, I have also found it necessary to collect other information that is not yet collected in the annual return. I do this through a series of letters addressed to the water authority Chief Executives, each of which is assigned a code (e.g., WIC 1) for ease of reference.

Table 3.2 summarises the content of the letters issued to date.

Table 3.2: Water Industry Commissioner letters

Reference	Issue
WIC 1	Commercially Sensitive Customer Revenue Information and Data Request – requests details of non-domestic customer numbers, bills, volumes etc, split into various bandings. This information will be used to establish a base for expected non-household revenue streams, and to monitor any material movements from this base.
WIC 2	Investment Programme Monitoring – advises the requirements for the monitoring of delivery of investment via the Planned Investment Return and the Investment Quarterly Return.
WIC 3	Review of Infrastructure Renewal & Maintenance – request for estimates of asset condition and replacement costs to assist with Quality and Standards process.
WIC 4	Household Revenue Information and Data Request – request for details of domestic customer numbers, billing and collection levels, details of any relief of charges and analysis of secondary income. This information will be used to monitor revenue from households and will aid understanding of the issues of affordability and collectability.
WIC 5	Customer Service Performance Reports – expected requirements for the monitoring of the provision of customer service in general and Guaranteed Minimum Standards in particular, by way of three specified reports.
WIC 6	Quality Performance Assessments – my intention to introduce Quality Performance Assessments of written complaints received by the water authorities as an independent monitor of the service actually received by customers.
WIC 7	Scheme of Charges 2001–02 – request for authorities to submit proposed scheme of charges for the following year and supporting data.
WIC 8	Dates for submission of information to the WIC – clarification on timing and content of my information requirements following on from the Information Project.
WIC 9	Non-domestic Debt Analysis – request for analysis of non-domestic debt figures to allow me to monitor the financial impact of debt levels and assess the efficiency of the authorities' collection systems.
WIC 10	Information Project Action Plan – my feedback to authorities on the content of their Action Plans.
WIC 11	Not used.
WIC 12	New Opex and Spend to Save – my criteria for assessing the water authority's case for additional expenditure on new opex and 'Spend to Save' initiative.
WIC 13	Efficiency Analysis – impact of PPP schemes on controllable operating expenditure.
WIC 14	Special Agreements For Large Customers – request for information to monitor the special agreements created throughout the year and the financial impact they will have on future charging schemes.
WIC 15	Capital Investment and Efficiencies – summary of investment profiling after efficiencies that will be incorporated in the 2005–06 Strategic Review.
WIC 16	Development Constraints & Rural Sewerage Connections – request for costs and outputs of high priority investment plans.
WIC 17	Annual Return Submissions – Sign Off Data Accuracy – required signatories for signing off Annual Return tables submitted to my office.
WIC 18	Q and S Final Output – project level information to be included in Quality and Standards process.
WIC 19	Investment Appraisal Project – discussion of involvement of water authorities in next phase of project and introduction of audit procedures to examine investment appraisal processes.
WIC 20	Request for Data Relating to Depots, Labs & Office Buildings – request for information to assess any possible impact of changes due to the inception of the proposed Scottish Water and any impact on operating expenditure.
WIC 21	Critical Information for Strategic Review of Charges – request for information on WIC 1, inter-authority trading, value chain analysis – retail and capital investment.

These WIC letters have been reproduced in Appendix F.

Section 2: Chapter 4
Methodology: Other Important Inputs to the Strategic Review

a) Introduction

Chapter 3 discussed the system of regulatory returns and letters that I established to enable me to draw effective comparisons. A number of other inputs have been fundamental to this Review:

- Review of techniques used by other regulators in assessing efficiency targets – I concluded that the Ofwat methodology was applicable to Scotland.

- Quality and Standards process – an 18-month intensive effort designed to define the levels of investment required to ensure a sustainable water industry. This included the investment required to meet public health and environmental standards and the investment required to maintain the asset base properly.

- Capital Maintenance Planning Initiative – this was an important input to the Quality and Standards process. The investment expenditure of the water authorities had been insufficient properly to maintain the underground network of pipes. This was an issue highlighted in my interim Review. This initiative was designed to identify the required levels of maintenance on underground infrastructure.

- Transport and Environment Committee Report[1] – I took full account of the view expressed by this Committee's inquiry into the water services industry. I noted their recommendations for the industry.

- Public expenditure – I have taken full account of the letter commissioning this Review. In this letter, Ross Finnie, MSP, instructed me to ensure that public expenditure constraints were not breached. I have tried consequently to phase investment and price increases in order to ensure that there is a margin between the public expenditure constraint and the actual need of the industry.

b) Review of the techniques used by other regulators

I have studied the methodology employed by other regulators to ensure that the efficiency targets imposed on the Scottish water authorities are appropriate, fair and robust. I have noted the substantial efficiencies that have been made in other industries. I wanted to understand the methods used in achieving these improvements. I have, therefore, sought to adopt any successful techniques. The key tool used by other regulators is benchmarking. Comparison is very useful both in determining an answer and in convincing management that the answer is correct.

My review suggested that the Ofwat methodology of calculating efficiency targets was applicable to the Scottish water industry and that this method had been subjected to extensive external scrutiny and was both comprehensive and reliable. The techniques used by other regulators, notably Ofgem and Oftel, are designed to take account of more developed competitive markets. I believe that they may be more relevant in the future. I have however used a modified version of the Ofwat process to inform this Review. I have modified the Ofwat approach only to take account of the different situation in Scotland, both in terms of the industry's ownership and asset structure.[2] The advantage of this similar process is that the Scottish industry is being judged against its most likely competitors.

i) Operating expenditure

Ofwat's principal tool for determining relative operating efficiency is econometric modelling. Ofwat's suite of models, detailed in Chapter 7, is designed to benchmark various aspects of each of the English and Welsh companies' service against the best performers in the industry. This technique contributes to the creation of individual efficiency targets. Ofwat will, however, always try to ensure that companies are given sufficient incentive to exceed the target imposed.

I have used a modified version of Ofwat's models to assess the efficiency gap between the Scottish industry and the best performing comparator companies in 2005-06. I have tried to set a reasonable target based on the result of the models, the customer's need for affordable charges, and the capability of management to achieve the target. The results are set out in Chapter 18.

ii) Capital investment

I have also applied the Ofwat cost base technique as a basis for calculating capital efficiency targets for the Scottish

[1] 21 June 9th Report, 2001: Report on Inquiry into Water and the Water Industry.

[2] As Scotland has a large number of small treatment works, I had to adapt the Ofwat methodology (see Chapter 7). The information requirement also had to be adjusted to take account of Public Private Partnerships.

authorities. I have extended the Ofwat methodology to look at the capital investment process as a whole.

Efficiency improvements are required across four broad areas, and these are set out in Chapter 19. The extent of improvement required in each area has been determined from quantitative sources, such as cost base analysis adopted from Ofwat, and from qualitative information.

c) Quality and Standards process

i) Background

The Quality and Standards process is designed to set out the standards of drinking water quality and environmental protection that the authorities need to meet, and the associated costs. This prioritisation of the investment programme is disciplined and made more rigorous by requiring a consensus of all key stakeholders in the Scottish water industry. These stakeholders are:

- The Scottish Executive – has overall responsibility for the policy and regulatory framework for the water industry and is also responsible for ensuring compliance by the water authorities with specified drinking water quality standards.
- SEPA – is responsible for ensuring that the water authorities comply with statutory environmental protection standards set mainly by the European Union.
- The Water Industry Commissioner for Scotland – is the customer services and economic regulator of the water authorities.
- The water authorities – must plan, maintain and operate the water supply and sewerage service for their customers.

ii) Quality and Standards: options

Investment can be divided into those elements where there is little or no discretion and elements which, at least in the short to medium term, do offer choices. The Quality and Standards process sets out to document the investment required to ensure compliance with environmental legislation and public health standards. No less important is the focus on investment required to ensure that the infrastructure that provides the service is maintained and refurbished appropriately.

The Scottish Executive published a consultation document entitled *Water Quality and Standards 2002-06* in January 2001 that set out clear options for the water authorities' capital spending programmes. Customers were asked to consider their preferences for the future priorities of the water authorities. These include the trade-offs between meeting standards by long-term measures such as building new and improved plants or more temporary measures such as increasing operational costs and/or further patching up existing treatment plants. The quick-fix method may be cheaper in the short term but is certainly more costly in the long run. The Quality and Standards process also highlights decisions regarding the speed with which underground assets are replaced, and takes account of the current backlog and performance of the networks.

The consultation document offered a choice of three options.

- Minimum option - this meets the standards set by regulations on water and sewerage treatment. This option has low-cost capital solutions but does not address the running cost implications of having to manage deteriorating existing assets, such as treatment plants, water mains, and sewers.
- Central option - this meets the legal standards and makes some improvements to the assets, although only investing enough in the underground infrastructure to prevent further deterioration.
- Enhanced option - this allows substantial progress towards modernising all assets. It is also the only option that includes significant resources for removing development constraints, and first time connections.

The water authorities agreed the projects required to deliver the outputs of each option with the quality regulators and calculated the likely costs. These are set out in Table 4.1.

Table 4.1: Overall level of investment (£ millions) 2002–03 to 2005–06

	Minimum option	Central option	Enhanced option
East	£420m	£500m	£710m
North	£640m	£790m	£1,150m
West	£700m	£920m	£1,150m
Total for Scotland	**£1,760m**	**£2,210m**	**£3,010m**

The consultation document also made an attempt to ensure that customers understood what this investment would mean in terms of water charges. Table 4.2 provided a useful indication of the cost implications of each of the minimum and enhanced options when compared with the central option.

Table 4.2: Approximate difference in average domestic charges, compared with central option

	Average domestic charge 2000–01	Minimum option	Enhanced option
East	£184	£20–£30 lower	£60–£70 higher
North	£237	£50–£60 lower	£100–£120 higher
West	£169	£30–£40 lower	£50–£60 higher

iii) Quality and Standards: consultation

The consultation document set out the options for investment and invited responses.

In particular, responses were invited on the following questions:

- Which option achieves the best balance of costs and benefits?
- Should the same standards apply throughout Scotland, even though this would mean markedly different charges in different areas?
- At what speed should underground pipes be renewed? Past under-investment has left a major backlog. The more money invested, the less the risk of the system breaking down and leading to a poorer service to customers. Are customers prepared to accept a higher risk of such interruptions to enjoy a lower bill, at least in the short term?
- At what rate should highly desirable spending which is not actually mandatory take place, e.g. removing development constraints and first time connections to the water and sewer network in rural areas?

Comments on the issues and proposals had to be received by the Scottish Executive by 30 March 2001.

iv) Quality and Standards: results of the consultation

There were 40 responses to the consultation paper. These were principally from local authorities and environmental organisations. Despite the potential for lower charge levels under the minimum option, only 5% of respondents supported the minimum option. Some 42% (including SEPA) supported the enhanced option. These respondents argued that there was a clear opportunity to invest properly in Scotland's water services, and to deal with the backlog of under-investment in the underground network of pipes. They argued that this would improve the level of service to customers by reducing the risk of burst water mains and flooding from sewers. Some 53% (including the three water authorities and the Water Industry Commissioner) supported the central option.

The lack of support for the minimum option pointed to the choice lying between the central and enhanced option.

The Scottish Executive has concluded that the balance between sustainable improvements and cost to customers means that the central option is the more attractive option. There was a difficult balance to be struck between the impact on customer charges and the undoubted benefits of the enhanced option. In the end a compromise was reached, which included within the finalised central option some extra investment to help ease the constraints on new developments, and to allow first time sewerage provision in rural areas. The final costs, as published in the final paper in August 2001, are shown in Table 4.3.

Table 4.3: Final paper overall level of investment (£ millions) 2002–03 to 2005–06

	Central option
East	£530m
North	£810m
West	£1,000m
Total for Scotland	**£2,340m**

My advice on revenue caps takes full account of the investment required to achieve the outputs of the improved central option. I have, of course, applied capital efficiency targets to the water authority's costings of investment required. My methodology to assess the scope for capital efficiency is discussed in Chapter 8.

d) Capital maintenance planning

i) Importance of capital maintenance

Proper maintenance of the underground assets is essential to delivery of improved quality and standards. Investment in

treatment plants will not deliver its full potential if the distribution and collection networks are not properly maintained. Customers require services to be available 'on demand' and at reasonable cost. This can only be achieved by planning expenditure to address infrastructure maintenance pro-actively. The management of assets in Scotland is complicated by the relatively poor quality of information available. I am keen, however, to see capital maintenance prioritised and to ensure that the lack of information does not become a justification for inaction.

ii) Role of the Water Industry Commissioner for Scotland

The water authorities assess the costs of the quality and growth investment in the Quality and Standards process independently. The extent of this investment is agreed between the quality regulators and the water authorities. The situation with capital maintenance is quite different. There is a clear customer interest in ensuring that responses by the water authorities to actual or perceived funding constraints do not store up problems for customers later. This is particularly relevant to the underground infrastructure, which accounts for some three-quarters of the value of total assets. There is a significant risk that if there are no clear targets for maintaining these critical assets, then pressure to meet budgets could lead to unreasonable delays in investing in their maintenance. It is easier to store up problems in this area simply because the underground assets cannot be seen. I have therefore sought to ensure that the water authorities are paying full and proper attention to maintaining their underground assets. I have taken this into account in my Review.

iii) Methodologies applied by water authorities

The Scottish Executive asked that a serviceability approach to customers should be adopted for the central option in Quality and Standards. In addition, it was agreed that the level of maintenance by the authorities should be ramped up over the four-year period to reach the equivalent of a long run normative charge. This long run normative charge is the cost of maintaining the infrastructure in its current condition. It is defined as the modern equivalent asset cost[3] divided by the average life expectancy of the assets.

The authorities have used differing methodologies to assess their requirements for capital maintenance investment. This is at least in part a result of the availability of information. East of Scotland Water Authority used information from its Integrated Network Management System. Its focus was principally on performance measures. West and North of Scotland Water Authorities modelled requirements based on estimated lives of infrastructure. This was based largely on information about the condition of assets. However, they each used different methods to calculate their investment requirement.

The development of integrated network management strategies and asset management programmes has already improved consistency across each of the three authorities. There should be a fully consistent approach in place by the next Quality and Standards process.

iv) Ofwat approach

My starting point to assessing the capital maintenance requirement of the authorities was to examine the Ofwat approach.

The current Ofwat framework for both above and below ground maintenance is based on a four stage approach, as follows:

- Serviceability assessment – a review takes place of the trends in performance of the asset systems in delivering services to customers using 11 indicators. These indicators show whether the trend was improving, stable, deteriorating or marginal.
- Consider future period – Ofwat then considers what could be different about the next period that might necessitate changes in typical levels of activity.
- Consider scope for improvements in efficiency – Ofwat uses cost base analysis and econometric modelling to determine the scope for efficiency.
- Assessment of the impact of the quality improvement programmes on normal capital maintenance programme.

I believe that the Ofwat approach is robust and would intend to use it in Scotland in the future. However, there is currently insufficient information available to use this approach. Specifically, there is no trend data and no opportunity to use the econometric models.

v) Initial approach

In May 2000 I asked the authorities to submit information on the condition profiles of their mains and sewers. The responses

[3] The gross replacement cost of the water mains and sewers with modern equivalent assets. According to Ofwat's Information Note 35A in March 2000, the average for water mains is £120 per metre and for sewers £345 per metre.

are recorded in Table 4.4. The profile for each authority is worse than the average in England and Wales. This is particularly true in the North, where two-thirds of the water mains are in Condition Grades 4 and 5. Condition Grades 4 and 5 mean that on average the assets are within 10-15 years of the end of their expected life.

I subsequently developed two separate models to establish sustainable scenarios of infrastructure management and replacement. These models introduced varying degrees of risk.

My first method was to model the deterioration of assets over time. The model assumes that Grade 4 and 5 assets are replaced by Grade 1 assets. I designed the model to provide an annual required investment to ensure that the condition and performance of the underground assets remained acceptable.

I established two profiles for expected life of the assets and three profiles for the rate of deterioration of the asset. The two profiles for the expected life of the assets are 66 and 80 years for water and 80 and 100 years for sewers. The three profiles for the rate of deterioration are set out in Table 4.5.

My second model assumes that a certain asset depreciation charge is required each year to be able to replace the asset at the end of its life. It additionally sets up a methodology to bring current asset profiles into line with what would be more desirable. This essentially models a 'market' or cost estimate for the 'replacement to a desired level' for infrastructure assets. In this market, I valued assets at a percentage of their full replacement cost value (£120,000 per kilometre for water mains and £345,000 per kilometre for sewers) depending on their declared condition grade. My percentages are set out in Table 4.6.

Table 4.6: Breakdown of underground asset stock by Condition Grade

Condition Grade	Water	Waste water
1	100%	100%
2	70%	70%
3	40%	40%
4	10%	10%
5	0	0

I assumed that the current profile of assets can be improved to match the desired profile for a price, which will reflect the costs of improving the current profile to the desired profile. I did not therefore have to replace old with new. This model therefore attempted to model practical reactive maintenance rather than replacement of catastrophic failure.

I ran sensitivity options through each model, introducing alternative lifespans for assets.

In August 2000 I submitted a paper to the Scottish Executive on the cost implications for customers of the necessary programme for maintenance and replacement of infrastructure. This paper described the results of these models.

Table 4.4: Condition profile of water authority mains and sewers

	East		North		West		Ofwat average	
	Water	Waste water	Water	Waste water	Water	Waste water	Water	Waste water
Categories 1–3	66%	88%	34%	71%	73%	68%	88%	90%
Categories 4–5	34%	12%	66%	29%	27%	32%	12%	10%

Table 4.5: Deterioration of water authority assets

Expected life (years)	Deterioration	Grade 1	Grade 2	Grade 3	Total (years)
66	Accelerated	13	20	33	66
	Even	22	22	22	66
	Slow	33	20	13	66
80	Accelerated	15	25	40	80
	Even	27	27	26	80
	Slow	40	25	15	80
100	Accelerated	20	30	50	100
	Even	33	33	34	100
	Slow	50	30	20	100

vi) Revisions

The conclusions of my paper on the maintenance and replacement of infrastructure were broadly equivalent to the infrastructure needs outlined in the enhanced option in Quality and Standards.

In order to calculate the cost of the central option, I revised a number of assumptions applied in my initial approach.

- I assumed a longer average life for critical sewers (120 years) but kept water unchanged. It could be argued that there are examples of pipes and sewers that have lasted much longer than these averages. However, they are averages and as such must also take into account assets which fail quickly, e.g. asbestos cement pipes.
- I set expenditure to maintain (rather than improve) the current profile.
- The modern equivalent asset cost was taken from the authorities' own information where possible.
- I assumed that the policy on maintenance of non-critical sewers would be reactive, as is the case in England and Wales, and not planned.

The results of the analysis are shown in Chapter 15.

The long run normative charge is increased because there is currently a disproportionate amount of infrastructure in Condition Grades 4 and 5. This reflects the extra reactive maintenance required. The normative charge will drop when the Grade 4 and 5 assets are replaced and the average condition and performance of the assets improves. It is therefore expected that the spend on infrastructure over the Quality and Standards period of 2002-06 is slightly higher than the very long-term average.

vii) Industry developments

There were significant differences between the estimates of capital maintenance from the companies and the determination of Ofwat during the 1999 Periodic Review in England (AMP3).

As a result of recent criticisms of the approaches of the industry and of Ofwat to capital maintenance planning, UK Water Industry Research (UKWIR) has commissioned an engineering services consultancy group to develop a common framework for capital maintenance planning within the UK water industry. Ofwat, the Drinking Water Inspectorate, the Environment Agency, the Water Industry Commissioner for Scotland and the Department for Environment, Food and Rural Affairs (DEFRA) are all supporting this initiative. A key deliverable will be the development of proposals for improved 'serviceability indicators' for the performance of the distribution and collection infrastructure. It is hoped that these indicators will reflect the service provided to customers and the impact on the environment.

I was keen to participate in this initiative since I believe that it will be equally applicable in Scotland. Until the asset data in Scotland improves and these output measures are clearly defined, the Scottish Executive has advised that the authorities' maintenance of infrastructure should be monitored on the basis of the length of mains or sewers renewed. Credit will be given where the authority can demonstrate that a more cost-effective solution to renewal is found, for example by installing pressure valves. These outputs are to be delivered within the capital investment budget available to the authorities. I will monitor both spending on and delivery of these outputs.

e) Transport and the Environment Committee

The remit of the Transport and the Environment Committee includes a duty to consider and report on matters relating to the environment and natural heritage, which fall within the responsibility of the Minister for the Environment and Rural Development. Given the unprecedented challenges facing the water industry in Scotland, the Transport and the Environment Committee signalled, in May 2000, its intention to carry out an inquiry into water and water services.

Prior to making its recommendations to Parliament, the Committee took oral evidence over eight sessions from 23 organisations with a special interest in the water industry. It also received 45 written submissions. The outcome of the inquiry was the production of a series of recommendations designed to create a sustainable, customer-focused industry. These recommendations have been noted and taken fully into account in the preparation of this Review.

f) McFadden Report

The Scottish Charity Law Review Commission, chaired by Jean McFadden, was appointed in March 2000 by the Deputy First Minister, Jim Wallace, with the remit of reviewing the law relating to charities in Scotland and to make recommendations on any reforms considered necessary. After extensive consultation with individuals and organisations throughout Scotland, the Commission presented a total of 114 recommendations to Scottish Ministers. One of its recommendations related to the issue of the reliefs provided to charities in respect of water charges. The report does not suggest how this relief should be funded. I have noted this conclusion and the view of the Transport and the Environment Committee in my discussion of charitable reliefs in Chapter 25.

g) Financing costs initiative

i) Review of financing costs

I have studied the debt of each of the three authorities. My revenue caps take full account of existing embedded debt. Embedded debt is the long-term debt of each authority, which carries a fixed coupon and is currently outstanding. There would be no benefit to using customer money to restructure the high coupon debt, as the net present value of this transaction would be zero. This would not compare favourably to the return on new asset investment, which is higher than the current cost of finance.

I have also reviewed in some detail the cash management of the authorities and the current credit markets. I identified opportunities for them to reduce their funding costs and my price limits have taken account of this.

ii) Comparisons with England

I have compared the cost of financing with England and Wales. This comparison shows that there is little difference between the current weighted average cost of capital of the authorities and that of the privatised companies. The cost of capital in Scotland should reduce significantly in the next few years as embedded high coupon debt matures and is replaced by new, cheaper borrowing.

iii) Assessment of lessons from Glas Cymru

I also compared the funding of the new not-for-profit company limited by guarantee, which has been established to manage the water service in Wales, with the Scottish public sector. I found that this company has a focused strategy and has benefited from a much lower net cost of capital than the rest of the private sector in England. The gross cost of capital is broadly equivalent to that currently available in Scotland. I believe that there are important lessons to be learned from Wales, but these are more about the risk of other non-regulated activities than any financing advantages that could be available to Scotland.

iv) Choice of financial ratios

I have reviewed a number of financial ratios and have concluded that a ratio of free cash flow (defined as operating cash flow minus maintenance investment expenditure) to interest payable is the most appropriate. This ratio will ensure that there is always an appropriate link between the costs of funding the authority and the money available to meet interest payments. Maintaining this ratio at a sensible level will ensure that the industry in Scotland is able to respond effectively to 'shocks' without large sudden increases in charges. My review of the equivalent ratio in England and Wales would suggest that interest cover in Scotland is not as healthy as would be desirable. I cannot allow this ratio to worsen substantially if there are not to be extra risks for customers. I have calculated the revenue cap in this Review in line with this prudent approach.

h) Public expenditure requirement

i) Assessment of impact public expenditure has on the customer

Public expenditure is made available to the water authorities. This is measured according to a resource budget allocation, which is designed to measure the actual resource cost of the water authorities on the Scottish budget. In practical terms, it allows the water authorities to borrow in order to supplement the income that they receive from customers. The significant increase in investment, even after I have adjusted the timing of projects, requires both an increase in charges and full use of all of the available public expenditure.

I have therefore focussed on ensuring that there is a sustainable balance between revenue and future investment by the end of this regulatory period. The proposed increases in charges will, if the efficiency targets are met in full, achieve this goal.

ii) Safety net created by not using full requirement

I recognise that if the performance of the water authorities in achieving their efficiency targets were less good than I expect, this would have an impact on the public expenditure requirement. I have taken this into account in my advice on revenue caps and have left an appropriate margin for contingencies. I have completed a full risk analysis (described in Chapters 33 and 37), which shows that I have struck a sensible balance between charges and the public expenditure requirements. The risk to both is minimised if management focus on their efficiency targets.

Section 2: Chapter 5
Methodology: Customers

a) Introduction

In this chapter I outline in more detail how I set out to understand the priorities of customers.

My approach has combined five elements:

- consultation with customers and representative groups,
- quantitative research,
- review of complaints received by my office,
- audits of customer service with the water authorities,
- other customer-focussed initiatives.

I will address each of these in turn.

b) Consultation with customers and representative groups

i) Consultative Committee meetings

The Water Industry Act 1999 required the establishment of a Consultative Committee for each of the three water authority areas. The role of these committees is to advise me on the promotion of the interests of customers of the three water authorities. Had it not been a requirement of the Act, I would still have looked to develop a similar opportunity to consult, as extensively as possible, at a local level. I chair each committee, which consists of seven members. I appointed a deputy chairman to assist me in realising the potential of this initiative.

The committees meet regularly in public, throughout Scotland, and by the end of March 2002 there will have been 14 meetings in each water authority area (see Appendix E). In addition, each committee has undertaken to meet up to 50 community groups during each year to carry out more direct consultation (see Appendix E).

These meetings provide an invaluable insight into the concerns of customers. One of the advantages of the committees is that they are able to discuss, one customer to another, issues in the water industry. They are not hindered by the accepted wisdom within the industry. The views that I receive from their thorough consultations have been most useful. In many cases I have found that the issues raised in these public meetings are broadly similar to the concerns of customers who contact my office with complaints. This reinforces the lessons that I learn from these complaints. It is valuable to meet affected customers first hand and I hope that real benefits have been received by many of those who have come to the meetings.

ii) Large User Group

I set up a Large User Group in May 2000, in order to understand the specific concerns of this group of customers. I also intend to use this group to monitor the standards of service received by large users from the water authorities.

For the purpose of this group I defined a 'large user' as a customer who uses more than 100 million litres of water annually, or who uses the equivalent in waste water or trade effluent services.

I selected the members of the group from all three authority areas. I tried to ensure that there was a good mix of organisations represented. I deliberately chose some of the biggest of the large users and some who are not far above the threshold. Public and private sectors are also represented.

I have arranged three meetings of the group to date. These meetings take place approximately every six months (July 2000, November 2000 and May 2001). I invited Neil Menzies, who has a background in the chemical industry, to act as Chair of the group (the views of the group are reported in Appendix E).

The members of the Large User Group are as follows:

Table 5.1: Members of the Large User Group

Company	Water authority area
Allied Distillers Ltd	West
Baird Malt Ltd	North
BP Amoco Ltd	East
British Energy	East
Caledonian Paper plc	West
Donside Paper	North
Esk Frozen Foods Ltd	North
Motorola Ltd	East and West
North British Distillery Co Ltd	East
Scottish Courage	East
Scottish Universities	East, North and West
Southern General Hospital NHS Trust	West

iii) Individual meetings with large users and other interested parties

In addition to the Large User Group, some large companies or organisations have requested individual meetings with me to discuss their views on the service provided by the water authorities. This has been an opportunity to try to resolve any issues raised. These meetings always provide a useful insight into the customer experience, and in many cases have influenced my work on service level initiatives.

Table 5.2: Dates of meetings with large users and other interested parties

Date of meeting	Large user
December 1999	BP, SmithKline Beecham
January 2000	SmithKline Beecham
May 2000	Herring Buyers Association
May 2000	Aberdeen Fish Curers and Merchants Association
May 2000	Aberdeenshire Council
May 2000	Aberdeenshire City Council
May 2000	Moray Council
June 2000	Scottish University Joint Committee
December 2000	Shepherd and Wedderburn
January 2001	COSLA
May 2001	Forth Valley Enterprise
June 2001	Shepherd and Wedderburn
July 2001	BAA

iv) Wider consultations with non-domestic customers

I also initiated a series of meetings with a number of representative organisations and trade associations in order to understand the views of the non-domestic sector. My office designed a questionnaire to help these organisations gather information and views from their members. This was useful in focussing my discussion with these organisations on the areas of principal concern for their members. My initial intention was to consult these groups on an annual basis, but in many cases it has been useful both to me and to the organisation to meet more frequently.

The responses to the questionnaire were analysed to reveal the general views of the non-domestic sector. Some of the most frequently expressed views are presented in later chapters of this Review.

The following organisations took part in the non-domestic consultation:

CBI Scotland
Chemical Industries Association
COSLA
Crofters Commission
Dundee Chamber of Commerce
Edinburgh Chamber of Commerce
Federation of Small Businesses
Highlands and Islands Enterprise
Institute of Directors
National Farmers Union
Scotch Whisky Association
Scottish Building Employers Federation
Scottish Consumers Council
Scottish Engineering
Scottish Enterprise
Scottish Landowners Federation
Scottish Tourism Forum

v) Panel of academics

I established a panel of leading academics to advise me and provide a 'sounding board' for initiatives. In particular, I was keen that they should cast an informed but independent eye over my analysis of the industry.

There were three issues that I was particularly keen to discuss with these academics. These were the efficiency targets; incentives and corporate governance; and affordability. These issues were discussed at three meetings in my offices in May, June and July this year.

The following academics make up the panel:

- Professor Tony Prosser, from the School of Law at the University of Glasgow.
- Dr John Sawkins, from the Division of Economics in the School of Management at Heriot-Watt University.
- Professor Bill McInnes, Professor of Accounting in the Department of Accounting, Finance and Law at the University of Stirling.
- Professor Brian Main, Professor of Economics in the School of Management and Director of the David Hume Institute at the University of Edinburgh.

vi) Domestic Forum

I was conscious that I had to understand the issues facing the most vulnerable customers. I was concerned that the view of these vulnerable customers may not be heard either through public meetings or through my programme of quantitative research. I therefore decided that I would need some help in assessing the views of those who are directly involved in trying to provide assistance to the vulnerable. I therefore asked Esther Roberton, former Co-ordinator of the Scottish Constitutional Convention, to assist me in contacting as many groups involved in working with the vulnerable as possible.

I am grateful to the following organisations that make up my Domestic Forum. Their views have helped me gain an insight into the issues faced by vulnerable customers and assist me in writing Chapter 24 of the current Review (the views of the Forum are reported in Appendix E). I hope that the work begun by this Forum can continue and will have a positive result.

The following organisations make up the Forum:

Age Concern
Child Poverty Action Group in Scotland
Citizens Advice Scotland
COSLA
Dundee Anti Poverty Forum
Dundee City Council
FLOW, Tayside
Highland Advice and Information Network (HAIN)
Heriot-Watt University
Lothian Anti Poverty Alliance
The Poverty Alliance
Scottish Consumer's Council
Scottish Local Government Forum Against Poverty
SCVO

c) Quantitative research

In order to obtain a more quantitative reflection of customer priorities I established the 'Water Panel'. The panel has a total of 2,250 members, with 750 from each water authority area. Panel members were selected by an independent market research company (TL Dempster Strategy and Research) broadly to represent the population and demographics of Scotland.

Two postal surveys have been carried out, the first in October-November 2000, and the second in March-April 2001. TL Dempster compiled the survey questionnaires and then analysed the results (these are summarised in Appendix E).

The first survey gathered information on:

- customers' awareness of who provides water and sewerage services,
- customer satisfaction with the service provided,
- customers' views on the most important issues facing the industry,
- customers' views on charges,
- customers' investment priorities.

A number of interesting insights arose from the first panel survey. I therefore commissioned a number of focus groups to establish a more in-depth, qualitative picture of customers' views.

One of the advantages of a customer panel is that there are opportunities to ask the same general question on a number of occasions. This allows me to understand how the views of customers are changing over time. The second survey therefore included some of the same questions to allow me to track changes in the panel's views.

However, the principal focus of the questions was on the following issues:

- customer contact with the water authority;
- competition and comparison with other utilities;
- charges, billing and affordability issues;
- investment priorities.

The results from this panel gave me a good insight into the views of domestic customers throughout Scotland. Their views have been important to me in completing this Review. Much of this document refers directly to responses to questions received from my panel.

The panel is useful because more than 80% of the panel have never had a reason to complain about their water or sewerage service. This means that their view should be broadly typical. The panel is also a mechanism by which I can access the views

of people who may not want to come to a Consultative Committee meeting.

d) Review of complaints

I reviewed the complaints that I have received from domestic and non-domestic customers. In a few cases, the complaint is not fully justified but in the overwhelming majority of cases there are significant issues raised. I believe that I have learnt from customer complaints in several ways. These include:

- the issue raised in the complaint,
- the way in which the authority initially responded,
- the final outcome of the complaint.

I have found that in many cases it is the initial response of the authority (rather than the original reason for complaint) that caused the complaint to be referred to me. Although there are not many complaints relative to the number of customers, lessons can be and are learned. These complaints do influence much of our work on developing customer service standards.

e) Quality performance audits

In 2000, I introduced quality performance audits, to measure Guaranteed Minimum Standards and compliance by the water authorities with their Codes of Practice. Each audit reviews 40 randomly selected cases and the quality of the response provided to the customer. These quality performance audits are an objective review of the service actually received by customers.

Any measurement and monitoring system must be fair and transparent. I therefore developed a clear set of definitions and an audit checklist. These definitions and checklist are used for each audit. This should help to ensure consistency and fairness.

General quality performance audits of complaints requiring a written response are carried out every three months. I have also introduced a more focused, specialised audit to study a particular area where performance appears to have been weaker and to identify scope for improvement. I use the objective criteria of the checklist in conducting either the general or specialised quality performance audits. There is a clear yes or no outcome for each of the criteria in the checklist. These criteria include:

- Are the customer's details correct?
- Does the response answer the complaint?
- Is the response in plain English?
- Is the response customer friendly?
- Does the response contain an apology (if appropriate)?

I have also introduced telephone audits. The majority of complaints are by telephone, and I felt it important to monitor the quality of call handling within the water authorities. I established similar rigorous and objective measures on the checklist for the telephone audits.

Calls are measured against criteria including:

- Did the call-handler give his own name?
- Did the call-handler ask the customer's name?
- Did the call-handler ask appropriate questions?
- Was the call-handler friendly?
- Was unnecessary jargon avoided?
- Was there an offer of help?
- Was the customer thanked for calling?

These criteria ensure that an objective assessment of performance is possible.

These audits have provided useful information for this Review. The results have certainly influenced my view on the desirability of tightening customer service standards further. I believe that the results have also further reinforced the need to ensure that price increases are kept as low as possible. I will continue to monitor service standards and will expect them to improve during this regulatory period. The efficiency targets have been set at a level that assumes this improvement.

f) Other customer-focused initiatives

I have also studied issues concerning billing, the development of service levels in other utilities and the relationship between the revenue cap and the impact on prices. I describe each of these below.

i) Customer charges

I have compared price levels in England and Wales and in Scotland. In order to compare non-domestic charges, I compared the impact of tariffs on typical businesses. In most cases, the composition of charges faced by an organisation should be broadly similar to one of these case studies, although inevitably the size of bill will vary. I have compared domestic charges by using an average charge for the area.

Three of my WIC letters are particularly relevant to developing an understanding of the charges faced by customers. WIC 1 is about charges paid by non-domestic customers. The aim was to monitor the impact of competition or declining water use. Unfortunately, this information is not yet fully reliable. I have also not yet had responses to my WIC 4 letter. This asked for information about outstanding debt amongst domestic customers. This debt was to be divided by Council Tax bands and whether the debt was from someone in receipt of full, partial or no Council Tax benefit.

I have received responses to my WIC 9 letter on non-domestic debt. This has influenced my views on bad debt, direct billing of domestic customers and responses to competition.

ii) Lessons learned from other utilities

I believe that I can learn from the progress that other utilities have made in improving levels of service. I have therefore reviewed all of the publications issued by the other utility regulators and consumer watchdogs in framing this advice.

My staff and I have also had a number of meetings with the privatised water companies in England and Wales and with the electricity and gas companies. These sessions have been useful in confirming that most of these companies have experienced the same issues as those currently faced by the water authorities in Scotland. These companies have clearly met the challenge of improving customer service and efficiency, but they were not always successful immediately. I believe that value for customers in Scotland can be improved more quickly if we learn from the initial mistakes made by these organisations.

iii) Calculation of revenue cap

The principal aim of the Strategic Review of Charges is to make a recommendation of an appropriate revenue cap for the water industry. Revenue, however, is different to price. If water consumption falls, then price increases will need to be higher to generate a specific level of revenue. If a customer goes 'off-network', this has the same effect. However, the number of domestic households is increasing by nearly 1% each year, and this helps reduce price relative to the revenue cap.

iv) Calculation of impact of revenue cap on prices

The information that I collect from the water authorities and from other sources allows me to make an estimate of the impact on prices of any revenue cap.

I am clearly concerned that any revenue cap has implications for prices that are as affordable as possible.

Section 2: Chapter 6
Methodology: Opportunities for Competition

a) Introduction

There is no question that competition can bring benefits to customers. One of my principal concerns in completing this Review was to understand the potential impact of competition in the water industry on customers and in particular the threat posed to revenue in Scotland. In this chapter, I outline how I identified and investigated the possible types and effects of competition.

b) Potential impact on customers

The obvious starting point was to review the development of competition in other utility sectors, such as gas and electricity. One of the key questions that I wanted to answer was the extent and scope of competitive activity. I also sought to define what characterised a natural monopoly. I have carried out extensive research into these sectors, in order for comparisons to be drawn with the Scottish water industry. This research has included examining analysis of information from other regulatory offices and government departments. I have also drawn upon a number of other studies into the utilities. In addition, I arranged a number of formal interviews with key players in the industry, City analysts and utilities consultants.

My consultation with City analysts and utilities consultants was particularly informative. Their perspectives on barriers to entry and the critical mass required to flourish in the competitive retail sector have been an important factor in my conclusions. It has also been useful to discuss the competitive dynamic in electricity generation, in order to understand whether it can be repeated in the water sector.

I have analysed extensively the gross margins available in electricity and gas retail (the supply business) and in water. This again has influenced my view on retail competition. I have also studied retail price trends in the energy markets as a result of competition and the average discount required to encourage a customer to switch suppliers.

One of the most important elements of my analysis of the post-competition utility business is the pressure for efficiency. I have looked at the delivery of this lower cost and higher quality service. I identified that two broad factors play a role. First, there was the threat to revenue of genuine choice for the customer leading to a pressure for efficiency. This is ‘in the market’ competition.

Secondly is the option to a supplier to contract out activities to a third party. This can lead to a more efficient use of resources. Regulatory pressure for efficiency appears to have encouraged this trend. There have undoubtedly been benefits in terms of both levels of service and lower costs. I will call this 'for the market' competition.

c) Possible types of competition

I have looked at the development of competition in the water industry to date and its possible development in the future. I have found that the distinction between ‘in the market’ and ‘for the market’ competition is a useful tool in trying to analyse how competition may develop.

In order to understand where ‘for the market’ competition can take place, I have documented the business process value chain of the water industry. This splits the industry into four broad functions: ownership of assets, asset management, asset operations and interaction with customers. I have then outlined the key requirements for success in each of these functional activities, and made an assessment of the likelihood of the development of for the market competition. I have drawn heavily on my review of the experience of other utilities in trying to understand the potential influences on each of these activities. For each I have formed a view as to whether there is an alternative service provider to whom an incumbent can reasonably turn. It is clear that there are many organisations that want to own assets. It was less clear whether there were choices on the actual management of the assets – the decision whether, how and how much to invest to deliver an appropriate level of service.

I used two strategic business tools to assess the potential for competition ‘in the market’. I relied on applying an analysis based on the value chain and the ‘five forces’ model. These tools allowed me to assess the likelihood of new entrants in each discrete activity currently undertaken by a water authority. I was able to understand the likely extent of competitive threats and opportunities after having analysed each function in turn.

i) Value chain analysis

I used the value chain to divide the activities of the water industry into discrete functional activities. These are:

- abstraction of water,
- treatment of water,
- distribution of clean water,
- retail of water and sewerage services,
- collection of sewage,
- treatment of sewage,
- disposal of sludge and treated effluent.

I then requested information from the water authorities on the costs incurred at each stage of the value chain. This allowed me to assess the potential for and the impact of competition at each stage of the process. My estimates of the potential impact on revenue and the importance of cost management are largely based on this analysis. The relative balance of costs between activities that could be competitive (at least theoretically), and those that were clear natural monopolies has informed my views on the pricing of supplier of last resort[1] options and on the likely potential for 'off-network' deals.

My value chain analysis concentrated in detail on the retail function of the authorities. In June 2001, I asked the authorities to provide detailed information on the costs incurred in their retail function. I requested detailed information on the costs of billing, customer call centres, meter reading, debt recovery etc, in addition to any other costs that the authorities believed would be appropriate to allocate to the retail business. I believed that this was important, as it would show me the relative size of the retail activity in comparison with the other functional activities. In order to understand the competitive position of the authorities, it is important to understand their relative cost efficiency. This analysis highlighted the critical nature of the bad debt position in Scotland.

ii) Five Forces Model

This model requires an understanding of the value chain of the industry. Professor Michael Porter of Harvard Business School developed this framework. The model states that there are five basic competitive forces upon which the state of competition in any industry depends. He explains that these forces can be ranked in intensity from low to high, depending on the dynamics of the industry in question. The five forces are as follows:

- Threat of entry – Porter gives a number of examples of barriers to entry, such as economies of scale, capital requirements and product differentiation.
- Intensity of rivalry among existing competitors – depending on factors such as the number or relative market share of competitors (i.e. does one player enjoy de facto dominance because of his scale).
- Pressure from substitute products.
- Bargaining power of buyers.
- Bargaining power of suppliers.

d) 'Off-network' deals

I wanted to understand the threat posed by 'off-network' deals to the revenue of the water authorities. I requested information in my WIC 14 letter (see Appendix F) on the agreements reached with customers. My analysis of the value chain was also most useful in allowing me to conclude that cost allocation to each of the functional areas was the most critical single factor. This analysis has impacted on my views regarding 'supplier of last resort'; cost reflective tariffs; and the desirability of accounting separation.

e) Review with City analysts of high level conclusions

After I had completed my analysis of competition, I discussed my conclusions with a number of analysts, industry figures, potential new entrants to the water sector and other stakeholders. There was a surprising degree of consensus that competition in the water sector would be primarily restricted to the retail space. Their views have informed and further influenced my views. This Review is better informed because of these discussions.

[1] This supplier has to ensure that basic water and sewerage services are available in the event of a new entrant failing to meet its obligations.

Section 2: Chapter 7
Methodology: Operating Costs & Efficiency

The analysis of the authorities' costs and their efficiency relative to companies in England and Wales is a cornerstone of this Review. The results of my analyses, which are discussed in detail in Chapters 18 (operating costs), 19 (capital costs), and 20 (merger savings) show that the sustainability of the Scottish water industry in the public sector depends in a fundamental way on its ability to improve efficiency. My analysis of competition outlined in Chapter 11 makes this need for efficiency even more stark. I have therefore devoted considerable resource and effort to the analysis of the potential for efficiency. I have approached the analysis of efficiency in a number of different ways and used best practice methods of benchmarking to arrive at the most robust conclusion possible. The process that was followed is outlined in detail below.

a) Efficiency and the 'efficiency gap'

I had firstly to define efficiency in order that I could compare the water authorities in Scotland with the English and Welsh companies. I adopted a definition that is a pure economic definition whereby efficiency is achieved when an equivalent or better level of service is delivered to customers at a lower cost. I use this definition when I propose efficiency targets for operating expenditure and capital investment. I do not consider efficiency targets to have been met if the service delivered to customers has worsened, while costs reduce.

I use the annual information return from the authorities to draw comparisons with England and Wales. One of my first tasks was to understand fully the progress that had been made in England and Wales and how to measure efficiency. I found that the water and sewerage companies in England and Wales have greatly improved their efficiency since the mid-1990s and that they continue to make progress in response to targets set by Ofwat. The most important potential benefit to customers in Scotland derives from being able to compare the companies' performance with that of the authorities. This comparison informs my efficiency targets.

My assessment of the authorities' relative efficiency, and their scope for improvement, relies on detailed benchmarking that is focused on outputs, rather than on comparisons of processes. This Review assesses the scope for improvement, but it is for the water authorities to determine how those improvements will be delivered.

b) Comparative efficiency

I have followed Ofwat's lead in relying heavily on comparative competition. This is particularly useful in sectors where there is limited or no direct market competition. Customers in Scotland can benefit from the extension of comparative competition from England and Wales to Scotland.

Comparative competition works in a number of ways to achieve improvements in the water industry in England and Wales. By exposing measures of comparative efficiency within a peer group, it demonstrates to customers, to managers or to owners the degree of improvement required to achieve leading status. When this exposure is in the public domain, it stimulates companies to improve, through the reaction of stock analysts and shareholders, and in some instances through media and public reaction.

Continued exposure of relative performance introduces a powerful dynamic, as companies vie to outperform one another. Companies that do not try to outperform their peers risk depriving shareholders of the potential returns available. In England and Wales, comparative competition has delivered significant benefits to the customers of water and sewerage companies. There is evidence that comparative competition has already worked in Scotland. For example, each Code of Practice issued by one of the three authorities has strived to be better and more innovative than the existing Codes of the other two authorities. Clear objective comparison of Scottish and English performance should introduce a significant incentive to improve.

Ofwat's Annual Report on Efficiency and Unit Costs places its comparative analyses in the public domain. Among other results it contains a league table of relative operating efficiency on a scale of A to E, with position rankings for every company, and tables of relative unit operating expenditure. Examples of these tables follow.

Table 7.1: Ofwat league table for relative operating efficiency, 1999–2000 (water and sewerage companies)

Company	Water band	Water rank	Sewerage band	Sewerage rank
Anglian	A	5	C	4
Dŵr Cymru	D	10	D	10
North West	B	7	C	7
Northumbrian	A	2	C	9
Severn Trent	B	8	C	5
South West	C	9	C	8
Southern	A	3	C	6
Thames	A	4	A	2
Wessex	A	1	A	1
Yorkshire	B	6	B	3

Table 7.2: Ofwat league table of volumetric unit expenditure, 1999–2000 (water and sewerage companies)

Company	Water delivered per cubic metre	Sewage collected per cubic metre
Anglian	31p	37p
Dŵr Cymru	44p	38p
North West	31p	31p
Northumbrian	26p	25p
Severn Trent	30p	30p
South West	36p	42p
Southern	28p	30p
Thames	29p	21p
Wessex	26p	24p
Yorkshire	31p	27p

Table 7.3: Ofwat league table of unit operating expenditure per property billed, 1999–2000 (water and sewerage companies)

Company	Water service per property	Sewerage service per property
Anglian	£65	£61
Dŵr Cymru	£88	£62
North West	£59	£54
Northumbrian	£56	£44
Severn Trent	£58	£50
South West	£69	£65
Southern	£55	£52
Thames	£67	£42
Wessex	£57	£42
Yorkshire	£59	£45

These and other league tables published by Ofwat inform and promote initiatives by companies to improve their efficiency. I have applied the same methods and rules as Ofwat to place the three Scottish authorities in these league tables, as an initial step towards assessing their relative operating efficiency. I am convinced that in order to deliver the fundamental improvements required by customers, it is necessary to understand fully the extent of the improvement that is possible. Therefore I have to pay particular regard to outputs in setting an efficiency target.

In the water industry, the outputs would include the following:

- Meeting agreed environmental standards.
- Meeting agreed public health standards.
- Meeting Health and Safety requirements of employees and public.
- Quality and continuity of service to customers, including agreed improvements.
- Meeting growing demands of existing and new customers.

c) Definition of operating expenditure

i) Components of operating expenditure

Operating expenditure comprises day-to-day running costs, as opposed to capital investment or financing costs. Operating expenditure therefore includes employment costs, electricity, materials, hired and contracted costs, local authority rates, insurance, software licences, and vehicle running costs. Bad debt is also regarded as an operating cost.

I have reviewed the operating costs incurred by the water and sewerage service undertakers in the UK. I have confirmed that they are broadly similar. This facilitates benchmarking, and enables me to analyse costs without large adjustments. My regulatory returns allow me to analyse operating costs by both function and activity. The analysis of expenditure by function provides information on what it costs to provide a particular service. The analysis by activity shows the cost of each activity comprising a service.

The breakdown by function is shown below:

- Water service: Water resources and treatment
  Water distribution
  Business activities

- Sewerage service: Sewer network
  Sewage treatment
  Sludge treatment and disposal
  Business activities

The breakdown by activity is as follows:

- Direct costs: Employment
  Power
  Hired/contracted services
  Agencies
  Materials and consumables
  Charges levied by environment regulator
  Bulk water imports
  Other
- General and support
- Business expenditure: Customer services
  Scientific services
  Local authority rates
  Doubtful debts
  Exceptional items
  Third party services
  Other

My regulatory return defines these functions and activities very clearly. The definitions used are the same as those used by Ofwat.

ii) Underlying operating expenditure

One-off items of expenditure, which are unlikely to be repeated on a regular basis, can affect reported operating expenditure. Examples would include the costs of dealing with the millennium bug, abnormal pension contributions, redundancy payments, rates rebates, and unusual weather conditions.

My analysis depends upon accurate and fair benchmarking. My assessment of the Scottish water authorities' relative efficiency in operating expenditure therefore takes into account reported one-off costs, both their own and those reported by companies in England and Wales.

iii) Base service operating expenditure

There are many factors that could justifiably increase operating costs. These include:

- better standards of customer service,
- growth in the customer base,
- growth in customer demand,
- more sophisticated and effective processes for treating drinking water or treating sewage effluent.

I have endeavoured to make adjustments to ensure that these factors are taken into account before comparing trends in operating expenditure. The pace of improvement required, and the resulting cost increase, may vary from region to region, or over time. My assessment of future running costs also needs to allow for any improvements in standards.

As a consequence, the companies in England and Wales report two operating expenditure figures; one for base service and one for total operating expenditure. I have placed similar reporting requirements on the water authorities. Base service expenditure comprises the cost that is incurred simply to maintain a constant level of service from some agreed starting point. Total operating cost includes the base service and net additional running costs associated with improvements. I can compare the underlying trends in operating expenditure more fairly if new net additional costs are stripped out.

d) Review of trends in operating expenditure in Scotland

I have been keen to understand the current situation in Scotland. I have therefore completed a comparison of base operating costs for each of the authorities separately and jointly. I have observed that base operating costs have been increasing at a time when they have fallen quite rapidly in England. This has been a most important input into my risk analysis later in this Review.

e) Factors that influence operating expenditure

I have also had to develop a complete understanding of the factors that determine operating expenditure. This is essential to robust benchmarking and target setting. There are several important factors, other than management efficiency and employee productivity, that can influence operating expenditure in the water industry.

These include:

- difficulty of operating environment (population distribution and density, topography and terrain, water availability and types of source, coastal or inland character, etc);
- customer mix (domestic, non-domestic, metered, unmeasured, large/small industrial user);
- customer requirements (resolving complaints, etc);
- environmental requirements (leakage levels and targets, restrictions on water resource use, sewage effluent standards, etc);
- nature of the assets operated and maintained (size, mix, performance);
- volumes (water consumption, peak use, sewage loads);
- regional variations in charges for local authority rates, water abstraction, sewage discharges;
- regional variations in services such as mains diversions, sewer diversions ('third party' services);
- regional variations in market rates for salaries, electricity or other costs.

These cost drivers can be regarded as outwith significant management control in the short term, for an efficiently run business. However, poor management can mean that charges incurred for local authority rates or electricity are higher than they need to be, or that insufficient attention is paid by managers to limiting the impact on costs of their operating environment.

My approach to benchmarking is therefore to determine, by detailed analysis of the available information, the way in which the factors listed above influence actual operating expenditure for each of the water authorities. My revised econometric models estimate the effect on costs of operating environment, 'customer base' and assets and volumes. I exclude costs that may be affected by regional distortions such as local authority rates.

My aim is to normalise costs across all of the authorities and their comparators, so that the variations that remain are likely to be associated with differences in efficiency. Comparisons of normalised operating expenditure allow me to calculate fair targets for each authority.

f) Controllable operating expenditure

In the long term, all costs, including those regarded as 'fixed', can be controlled. The degree and pace of control depends on the nature of the cost, and on the extent of unnecessary expenditure being incurred in any particular activity. I believe that my targets to reduce operating expenditure have to be both within the scope of managers to control and deliver, and sufficiently challenging to ensure that all costs are carefully scrutinised.

My analysis has taken account of comments by the water authorities and by the companies in England and Wales that a large proportion of their costs are not controllable. The empirical evidence from England and Wales, however, is that the companies nevertheless outperform efficiency targets and succeed in reducing these 'uncontrollable costs'. This experience suggests that a substantial proportion of costs are more controllable in the short term than would initially seem likely. For example, costs such as rent and business rates are in part a function of office space and the number of employees. Ofwat's approach is to apply efficiency targets to all costs, and I consider this to be equally appropriate for Scotland. I have, therefore, taken a top down approach to target setting, and feel it inappropriate to apply specific targets to different elements of spending.

g) High level benchmarking with England and Wales

I have conducted a series of high level benchmarking exercises, which compare the water authorities' unit costs with that of the companies in England and Wales. This is a useful exercise, but it is not a measure of efficiency. Differences in the operating environment outside the authority's or company's control, and assumptions made when estimating the amount of water delivered and sewage collected, both lead to variations in these unit costs.

I have made the following comparisons of unit cost:

- unit cost to customer per cubic metre of water delivered;
- unit cost to customer per cubic metre of sewage collected;
- unit operating cost per property billed (household and non-household) for water;
- unit operating cost per property billed (household and non-household) for sewerage.

I have also identified those companies whose operating environments most closely resemble those of the three authorities. Ofwat's econometric models are designed to correct for these differences, but I wanted to make my comparisons as relevant as possible to Scotland. My assessment of appropriate 'comparator' companies included:

- overall size (number of customers and asset base);
- ratio of infrastructure length (mains and sewers) to the number of customers;
- ratio of the number of above ground assets (treatment works, pumping stations, water storage facilities) to the number of customers;
- population density.

These criteria ensure that the comparator company has a similar urban/rural population split and a similar asset base. Northumbrian Water and Yorkshire Water emerged as clear comparators for both East of Scotland Water Authority and West of Scotland Water Authority. The closest comparators for North of Scotland Water Authority were South West Water and Welsh Water (Dŵr Cymru). In the case of North of Scotland Water Authority, there are significant differences with these two companies, but the Tayside and Grampian areas of the North of Scotland Water Authority are quite similar. My annual return has allowed me to collect the relevant information and conclude that the Tayside and Grampian areas are no more or less efficient than the remainder of the North of Scotland Water Authority.

h) Overview of techniques used by regulators to set targets for operating efficiency

I have aimed to use regulatory best practice and draw as fully as possible from the experience of other regulators. Inevitably, my approach closely follows that of Ofwat. Ofwat's focus on robust measurable data and its recent experience in conducting a price review for the water sector were compelling reasons for using a similar process. However, I have also looked at what other regulators are doing.

The main difference between Ofwat and other regulators is that the latter tend to adopt a 'bottom up' approach to determining operating cost levels. They carry out detailed benchmarking across a number of well-defined activities. This is the case, for example, with the Office of the Rail Regulator, and the Office of Gas and Electricity Markets, OFGEM. I am not convinced that such an approach would be helpful in Scotland. The authorities do not yet have sufficiently robust cost allocation systems in place to allow proper conclusions to be drawn from comparisons of detailed elements of cost.

i) Detailed Ofwat methodology

Ofwat's approach to assessing operating efficiency targets is 'top down'. There is no attempt to identify particular cost elements and build up a total, item by item. I have adopted a similar approach for Scotland, partly because of the cost allocation issue, and partly because I am keen to avoid any suggestion that I am dictating how targets should be achieved.

Ofwat's principal analytical tool for assessing relative operating efficiency is econometric modelling. The models were originally developed by Ofwat and Professor Mark Stewart of Warwick Business School in the early 1990s. They were used for Ofwat's 1994 and 1999 price reviews. The models are updated and published at regular intervals.

Ofwat's approach to assessing relative operating efficiency, and the econometric models themselves, were endorsed recently by the Competition Commission, following a detailed review. This followed an appeal by two small water only companies, Mid Kent and Sutton & East Surrey, to Ofwat's 1999 price determination.

In January 2000, Ofwat's approach earned wide endorsement as an example of best practice from the Performance and Innovation Unit of the UK Government Cabinet Office. This was in the context of promoting policy decision making on the basis of sound data analysis. The report, entitled *Adding it up: improving analysis and modelling in central government notes:*

"Ofwat have a suite of 17 models which are used for calculating the relative efficiency of water companies as part of the price setting process. Outside scrutiny is intense. The water companies have a powerful incentive to test the limits of Ofwat's models. The Regulator knows that water companies can seek an investigation by the Competition Commission or ultimately judicial review. As a result Ofwat has consulted widely in the development of the models. The original suite was developed in association with academics at the University of Warwick. Throughout the process the models have been well documented and open to public scrutiny to secure feedback and encourage collaboration. As a result of this transparency the models are defensible in the public domain."

I have adopted Ofwat's econometric modelling procedures to benchmark the authorities' operating efficiency against the companies in England and Wales. This consistency in method will allow trends to be compared over the medium to long term. It will also ensure that the Scottish industry can be compared with some of the most efficient water undertakers in the world.

I have noted the view of the Competition Commission that alternative methods may have a place. I have therefore developed a detailed alternative model to provide a second analytically robust result. This model is described later. I also believe that the comparisons of unit costs provide a simple, broad picture of relative costs. Fortunately, all of these methods give me very similar results, and underpin my judgement that the analysis of relative efficiency is both accurate and robust.

Ofwat sets price limits so that companies have an incentive to increase efficiency. This framework promotes efficiency in the medium- and long-term interests of customers. This takes account of the challenge that Ofwat faces in having to find a balance between the customer and the shareholder. It is a challenge that I do not have to take into account.

i) Incentives

Ofwat's efficiency targets assume that relatively inefficient companies will substantially catch up with the more efficient companies. They further assume that all companies have the scope to make further improvements.

The incentives to managers to deliver efficiency have recently been strengthened. Shareholders now retain efficiency savings in excess of the regulatory assumptions (outperformance) for five years before these savings are transferred to customers. This encourages managers to seek efficiency throughout the regulatory settlement period. This should reduce the level of regulatory gaming[1].

Following Ofwat's price review in 1994, companies outperformed targets for operating expenditure efficiency by a factor of around two. This meant that customers and shareholders had similar shares of the gain in efficiency. Companies are now working to outperform Ofwat's latest targets, from the 1999 price review. Latest indications are that the level of improvement is again roughly double the target. While the Scottish situation is not comparable, and there is no need to trade customer and shareholder interests, I do believe that it is important that there is significant scope for outperformance made available to managers in the setting of regulatory targets. Management should, after all, want to show all stakeholders how good they are. My targets have been set with this principle in mind.

ii) Targets

Ofwat has three separate targets for operating expenditure:

- an industry-wide target of 1.4% annually that all companies must achieve - this anticipates technological change and innovation;
- a 'catch-up' target, requiring companies to close 60% of the initial efficiency gap between themselves and the leading company over five years;
- for new operating expenditure only, a separate target that combines the above two, but also incorporates a greater factor for technological change and innovation.

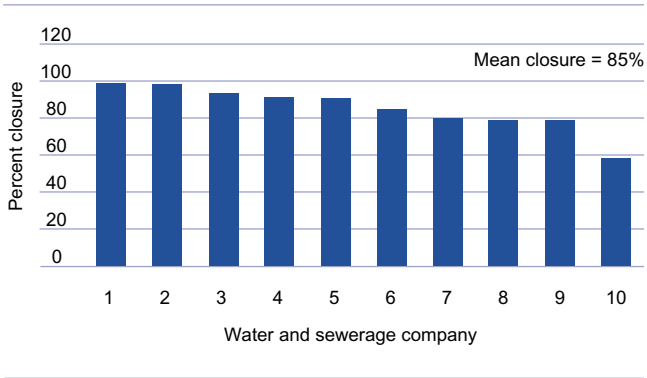
For Scotland, I have simplified this approach by taking as a benchmark the expected level of efficiency of the comparator companies in 2005. I have assumed that they meet but do not

[1] Gaming is strategic behaviour by companies, aimed at benefiting shareholders by influencing regulation; in particular the submission of costs for inclusion in the regulatory asset value which are relatively higher than those put into the profit and loss account, thus artificially raising the regulatory asset value and earning a higher cash return than would otherwise have been allowed.

exceed their targets. I have then assessed the degree to which the authorities could be expected to close the efficiency gap in the period up to 2005-06.

It is not appropriate for me simply to introduce the Ofwat method because I have allowed a very significant Spend to Save allocation of £200 million, which Ofwat has never allowed the English and Welsh companies. My analysis of the pace of improvement in operating efficiency by the water and sewerage companies supports the view that a closure of 80% of the efficiency gap is achievable in five years. Indeed, this is less than the average percent closure achieved by the privatised companies over their best five years. This represents a greater achievement than the target I have set in Scotland, because this analysis adopts, as the efficiency frontier, the performance achieved by the leading company in the fifth year, rather than the target set by the regulator. The performance of the companies is shown in Figure 7.1. The chart has had to be anonymised, as some of the information used was obtained in confidence from Ofwat.

Figure 7.1: Closure of efficiency gap by water and sewerage companies over five years



If I had used the Ofwat methodology and not allowed Spend to Save, my 80% target closure of the gap to the comparator (on the prudent assumption that there was no outperformance) would have slightly reduced the targeted closure (to 76%). However, if I include my Spend to Save provision, the proposed Scottish Water is being asked to close only 50% of the gap. I believe that my assumption that the companies will not outperform their targets leads to a prudent assessment of the efficiency gap.

iii) Econometric models

Details of Ofwat's operating efficiency models were published in the Ofwat technical paper *Assessing the scope for future water and sewerage company efficiency* (April 1998). Updated models were published in Regulatory Director letter RD2/99 (January 1999).

Water service

The water service has been split up into four sub-service models, and these are summarised in Table 7.4.

Table 7.4: Water sub-service models

Sub-service	Model type	Explanatory variables
Water resource and treatment	Linear model for unit cost	Population, number of sources, distribution input, proportion of supplies from rivers
Water distribution	Log unit cost	Population, proportion of total mains length with diameter>300mm
Water service power	Log linear	Distribution input, average pumping head
Water business activities	Log linear	Number of billed properties

- Water resource and treatment model

This model predicts the costs associated with water resources, the treatment process and the operating environment. Specifically, it takes into account economies of scale at water source level, and the difficulty of treatment as determined by the proportion of supplies that are taken from rivers. Costs per head are modelled rather than volumetric unit costs. This is in order to avoid rewarding high leakage, or penalising companies that have minimised demand.

Table 7.5: Water resource and treatment model

Water service	Resources and treatment expenditure	
Data: June Return	**Modelled cost:** resources and treatment functional expenditure less power expenditure, less Environment Agency service charges (£ million), divided by population (millions)	
Explanatory variables:	Coefficient	Standard error
Constant	0.866	1.23
Number of sources divided by distribution input	17.16	3.82
Proportion of supplies derived from river sources	6.72	1.43
Form of model: Resource and treatment expenditure (£ million) (less Environment Agency charges and power), / resident winter population (millions) = 0.866 + 17.16 * (number of sources/ distribution input (Mld)) + (6.72 * proportion of supply from rivers)		
Statistical indicators:	**Number of observations:** 28	**R^2:** 0.50

- Water distribution model

Ofwat carried out a thorough review of potential cost drivers for water distribution. There was no evidence in the reported information to suggest that mains length is a valid cost driver; and it is statistically inferior to alternative measures of scale. It was found that the length of large diameter mains (300mm diameter or more) is, however, significant. This result was not surprising because repairs, maintenance and inspection on large mains incur much greater costs than those on small mains. The model also reflects the higher costs of operating in urban areas, where the density of underground services and traffic congestion can impair productivity.

The model uses the ratio of the lengths of large mains to small mains as the cost driver. The unit costs are again expressed per head of population, rather than by volume. This reduces the potential to penalise companies with low leakage and/or low demand.

The model is shown in Table 7.6.

Table 7.6: Water distribution model

Water service	Distribution expenditure	
Data: June Return	**Modelled cost:** Log to the base e of distribution functional expenditure excluding power expenditure (£ million), divided by resident winter population (000s)	
Explanatory variables:	Coefficient	Standard error
Constant	–5.13	0.11
Length of mains greater than 300mm diameter, divided by total mains length	4.74	1.21
Form of model: Log to the base e of (distribution functional expenditure excluding power expenditure (£ million) / (resident winter population (000s)) = –5.13 +(length of main >300mm diameter (km) / total length of main (km)) * 4.74		
Statistical indicators:	**Number of observations:** 28	**R^2:** 0.39

- Water service power model

This model is based on the physical relationship between the amount of water pumped and energy required. It incorporates both vertical lift and additional lift to overcome friction in pipes. The model recognises that economies of scale are available in pump maintenance and negotiation of electricity tariffs.

The model is shown in Table 7.7.

Table 7.7: Water service power model

Water service	Power expenditure	
Data: June Return	**Modelled cost:** Log to the base e of power expenditure (£ million)	
Explanatory variables:	Coefficient	Standard error
Constant	–8.97	0.25
Distribution input (Ml/d) * average pumping head (m)	0.94	0.02
Form of model: Log to the base e of power expenditure = –8.97 + (Log to the base e of distribution input * average pumping head) *0.94		
Statistical indicators:	**Number of observations:** 28	**R^2:** 0.985

- Water business activities model

This model relates business activity costs to the number of billed properties. It recognises that there are economies of scale. Other potential cost drivers, for example the number of complaints, are ultimately within management control, and so are not considered valid explanatory factors.

The model is shown in Table 7.8.

Table 7.8: Water business activities model

Water service		**Business activities expenditure**
Data: June Return		**Modelled cost:** Log to the base e of business activities expenditure (including doubtful debts) less local authority rates (£ million)
Explanatory variables:	Coefficient	Standard error
Constant	–4.15	0.25
Log to base e of number of billed properties (000s)	0.97	0.04
Form of model: Log to the base e of business activities expenditure = –4.15 + Log to the base e of number of billed properties *0.97		
Statistical indicators:	**Number of observations:** 28	**R^2:** 0.96

Sewerage service

The five sub-service models are summarised in Table 7.9[2].

Table 7.9: Sewerage sub-service models

Sub-service	**Model type**	**Explanatory variables**
Sewerage network	Log linear	Sewer length, area, resident population, holiday population
Large sewage treatment works	Log linear	Total load, use of biological treatment, use of activated sludge, tight effluent consent for suspended solids and BOD
Small sewage treatment works	Unit cost	Works size, works type, load
Sludge treatment and disposal	Unit cost	Weights of dry solids, disposal route
Business activities	Unit cost	Billed properties

- Sewerage network model

This model expresses costs per unit length of sewer. It takes into account the amount of sewage being transported along the sewer. This is a function of area since this will affect surface drainage and costs associated with remoteness. This is also a function of population as this will impact sewage volumes. The model takes account of the higher costs expected in regions with a significant holiday population.

The model is shown in Table 7.10.

Table 7.10: Sewerage network model

Sewerage service		**Sewer network expenditure**
Data: June Return		**Modelled cost:** Log to the base e of sewerage network functional expenditure (£ million), less Environment Agency charges, per kilometre of sewer, for each sewerage area.
Explanatory variables:	Coefficient	Standard error
Log to base e of area of sewer district per kilometre of sewer	0.10	0.03
Log to base e of residential population per kilometre of sewer	0.53	0.24
Holiday population divided by resident population	2.26	0.57
Constant	–6.43	0.43
Form of model: Log to base e of sewerage area functional expenditure (less Environment Agency charges) per kilometre of sewer = –6.43 +log to base e of (area of sewer district/ sewer length) * 0.10 + log to base e of (residential population/ sewer length * 0.53 + (holiday population/ residential population) * 2.26		
Statistical indicators:	**Number of observations:** 62	**R^2:** 0.45

- Large sewage treatment works model

The large sewage treatment works model covers those sewage treatment works serving a 'population equivalent' of at least 25,000. Population equivalent is a measure of the amount of sewage treated, both domestic and industrial, expressed in terms of the number of domestic customers required to produce a similar volume.

The model takes into account the sewage load reaching the treatment works; the type of treatment in place (e.g. activated

[2] Biological Oxygen Demand – a measure of the pollution potential of sewage effluent.

Table 7.11: Large sewage treatment works model

Sewerage service		Costs of sewage treatment at large works
Data: June Return		**Modelled cost:** Log to the base e of functional expenditure on sewage treatment at large works (£000s) less Environment Agency charges and pumping costs
Explanatory variables:	Coefficient	Standard error
Constant	–1.85	0.29
Log to base e of total load [3]	0.77	0.03
Biological treatment used	0.23	0.09
Activated sludge used	0.48	0.08
Tight effluent consent for both suspended solids and BOD	0.11	0.06
Form of model: Log to base e of sewerage area functional expenditure on sewage treatment at large works (£000s) = –1.85 + (log to base e of total load) * 0.77 + 0.23 if biological treatment used + 0.48 if activated sludge used + 0.11 if tight effluent consent for both suspended solids and BOD		
Statistical indicators:	**Number of observations:** 359	**R^2:** 0.69

sludge increases power costs); and the quality of the discharged effluent required to meet environmental standards. The model exhibits considerable economies of scale in the treatment of sewage at the level of individual works.

The model is shown in Table 7.11.

- Small sewage treatment works model

This model uses average unit costs across England and Wales. This model therefore requires less data than the large works model. This is a necessary simplification given that there are thousands of small sewage treatment works. The cost matrix, shown in Table 7.12, takes into account the scale of the works – there are significant economies of scale – and the type of treatment process employed. I added an extra Band 0 to the matrix to take account of very small works found in some regions of Scotland.

- Sludge treatment and disposal model

This model compares the costs of sludge treatment and disposal to the volume treated and the methods of disposal

Table 7.12: The matrix of average unit costs

Unit cost (£000s /year per Kg BOD5 daily load)										
Size Band	**Primary**	**Secondary**		**Tertiary**				**Sea Outfall**		
		Activated Sludge	**Biological**	**A1**	**A2**	**B1**	**B2**	**Primary**	**Screened**	**Un-Screened**
0 Scotland	1.58	2.49	1.26	3.65	0.27	1.33	N/A	2.54	2.70	0.47
1 Scotland	0.80	1.26	0.64	1.85	0.13	0.67	N/A	1.28	0.78	0.11
1 England & Wales	1.07	1.70	0.86	2.48	0.18	0.9	N/A	1.72	1.09	0.19
2	0.21	0.68	0.44	0.91	N/A	0.53	0.50	N/A	0.04	0.05
3	0.13	0.44	0.30	0.37	0.46	0.30	0.21	0.10	0.03	0.02
4	0.13	0.26	0.15	0.21	0.26	0.17	0.18	0.16	0.02	0.01
5	0.11	0.12	0.08	0.08	0.07	0.09	0.06	0.08	0.05	0.01
6								0.04	0.02	0.01

Size bands are defined as follows, in terms of daily sewage load, in kg of BOD5 (a measure of the polluting potential of sewage):

0: <6 (Scotland only) 1 (Scotland): 6-15 1 (England and Wales) <15 2:15-30

3: 30-120 4: 120-600 5: 600-1500 6: >1500

Band 1 works in England and Wales would typically serve fewer than 250 population equivalent, and Band 6 more than 25,000.

Ofwat's matrix does not include Band 0, which is relevant only to parts of Scotland. Band 0 works would typically serve communities of fewer than 100 people.

Band 6 works, other than sea outfalls, are modelled separately in the large works model.

[3] Load is a measure of the quantity and type of sewage reaching the treatment works.

available. The model uses average unit costs across England and Wales. The unit cost approach is again a necessary simplification given the large number of sludge treatment and disposal facilities.

The average unit costs are shown in Table 7.13.

Table 7.13: Average unit costs for sludge treatment and disposal

Weighted unit cost of sludge disposed to:	£000s/thousand tonnes of dry solids
Farmland	223
Landfill	170
Incineration	233
Sea	130
Other	101

- Business activities model

This model uses an average unit cost per billed property across England and Wales. There are too few sewerage companies of sufficiently different size to allow economies of scale to be estimated. Sewage is treated by the ten large privatised companies in England and Wales.

The model has an unweighted average unit cost of business activities in England and Wales of £10.20 per billed property.

j) Revised Ofwat methodology to suit the Scottish situation

I outlined earlier the importance of ensuring that factors not controllable by management are taken fully into account. I have therefore had to consider very carefully the geographical, demographic and other differences that distinguish Scotland from England and Wales. Large parts of Scotland are rural. This means that, in some parts of their areas, the authorities operate treatment works and other plant on a much smaller scale. The costs of operating these works are inevitably higher than for larger works.

The Ofwat models do take due account of many of these differences. Ofwat also takes into account separately local factors and adjusts the econometric model results. Nevertheless, I have found it necessary to refine the analysis to take full account of some unavoidable cost differences. My revisions to Ofwat's methodology are as follows:

- A re-categorisation of water source types to include lochs, springs and burns. This affects the resources and treatment model.

- An extension of Ofwat's banding for small sewage treatment works (as noted above) to include a separate category comprising the many very small works in Scotland. I have also included higher unit cost for these works in the model.

I have also asked the authorities to submit their assessment of any local factors that influence their costs. These factors should be unusual in a UK context and so are unlikely to be covered by the econometric models.

I have included any claim that met the following criteria:

- the factors identified distinguish the authority from UK norms and demonstrate a clear difference with other water and sewerage service providers;
- the factors are not already directly or indirectly taken into account in the econometric models used for benchmarking;
- the factors are demonstrably and in principle outwith management control of the authority, in the short and medium term;
- the additional costs incurred have been properly identified, quantified and supported by direct (not proxy) evidence;
- actual costs in 1999-2000 and 2000-01 are presented;
- the authority has taken steps to limit the cost impact, where possible;
- there is no offsetting factor that would pass the above criteria but would reduce rather than increase operating costs.

k) Alternative approach

I developed an alternative model for two reasons: firstly to respond to the view expressed by the Competition Commission, to which I referred earlier; and second in order to confirm the result of the econometric models.

The alternative model was designed to take full account of the special circumstances surrounding the provision of water and waste water services in Scotland. It uses a fundamentally different approach from the econometric models. It is based on the premise that in most parts of the business, running costs

are driven by asset use, volumes and customers. This contrasts with the econometric models, which examine the interrelationships between these and other drivers, and concentrate only on those that best explain cost variation between companies.

This approach splits the business into ten different areas, as follows:

- delivery of water,
- resource and treatment,
- business activities water,
- bad debt water,
- simple sewage treatment,
- complex sewage treatment,
- running the sewer network,
- processing sludge,
- business activities sewerage,
- bad debt sewerage.

I have examined each business area to determine the most appropriate cost drivers. The number of cost drivers varies between one and five. The number depends on the quantity of material factors that influence the operating cost of each area. I identified three associated unit costs for each driver. There is a medium cost estimate, a high and a low cost estimate. These different cost combinations are combined together to produce 243 different combinations of predicted costs for each English and Welsh company and each water authority. This covers each of the ten areas identified above.

I determined the relative efficiency of each authority by dividing the 243 x 10 predicted costs by the actual reported spending by each company and each authority. I combined the ten areas to determine the overall efficiency of each company. My analysis of these ratios took account of any one-off costs and inflation. My approach therefore ensured that all relevant costs in the delivery of water and waste water services had been considered.

In order to use this model I had to estimate unit costs for each component. I determined the unit cost estimates in a number of ways, depending on the source and accuracy of the information available. The unit costs fell into the following categories:

- Category 1 - calculated directly from England and Wales or UK data;
- Category 2 - calculated to sum to reported England and Wales or UK totals;
- Category 3 - internal Ofwat/Water Industry Commissioner figure based on company evidence;
- Category 4 - figure derived from econometric model;
- Category 5 - plausible estimate;
- Category 6 - balancing item.

I incorporated prudent tolerance ranges into the model. I did this to ensure that the efficiency targets are determined for the authorities as accurately as possible. The tolerance ranges reflect the maximum uncertainty in the data, and are as follows:

- Category 1 → +/- 20%
- Category 2 → +/- 25%
- Category 3 → +/- 33%
- Category 4 → +/- 50%
- Category 5 → +/- 50%
- Category 6 → +/- 50%

I incorporated economies of scale into the model. I wanted to be sure that my results took account of the different size of assets used by each company and authority. I was therefore able to determine a standard sized asset and hence to calculate a single unit cost.

I wanted to ensure that both the econometric modelling and the alternative approach, although different and independent of one another, were consistent. I used the same comparator companies as with the econometric analysis.

I have made every effort in developing this model to ensure that it fairly represents the current operating cost position of the companies and authorities. It could be argued that this model should benefit the authorities more than the Ofwat econometric models. This is because this model is more asset based.

l) Prudent approach to targets

I have made a number of assumptions favourable to the authorities throughout my analysis. These are highlighted below:

- I have taken into account the authorities' claims for local circumstances in assessing funding needs.

- I have set the target at 80% of the total assessed gap.

- I calculated the gap against the comparator companies. They are not the leading company.
- I have compared the authorities with the privatised water companies. The achievements in other utilities have been even better.
- I have phased the target over the four years to 2005-06.
- My benchmarking includes the full costs incurred by the companies for leakage targets, domestic metering and other imposed costs not faced in Scotland. If I adjusted for these costs, the efficiency gap and targets for operating expenditure would have increased.
- I have made no allowance for outperformance by the companies of the 2000-05 Ofwat determination. I would, however, expect the companies to outperform their targets by at least 10%.
- I have made no allowance for operating expenditure savings by the companies in England and Wales in 2005-06 (as this extends into the next English and Welsh review period).

I believe that these favourable assumptions should ensure that my target is fair and, without question, achievable.

m) Additional operating expenditure to improve levels of service

I need to ensure that sufficient allowance is made to fund the operation of the new assets created to improve service. The Quality and Standards process (see Chapter 15) has determined the improvements that are considered necessary over the period 2002-03 to 2005-06. In some cases, the capital investment alone will deliver the required improvements to levels of service (e.g. a mains replacement project), but in many instances there are implications for operating expenditure.

Some of the costs of improved environmental standards and better service delivery are already assumed within the benchmarked targets. The authorities have examined their investment programmes for their expected impact on operating expenditure, and I have reviewed and compared the authorities' estimates with comparable figures for England and Wales. I want to ensure that credit is only given for a genuine improvement in service levels that has not already been included in the benchmarks. I have also reviewed these estimates to ensure that they are consistent with fully efficient operation of new plant and equipment. Examples of additional operating expenditures would include the following:

- improved response to customer queries and complaints;
- chemicals and filter media for more effective water purification;
- costs of services to customers in new housing developments;
- operation of processes to reduce pollution levels in sewage;
- tankering and safe disposal of sewage sludge previously disposed at sea.

I have taken into account the higher standards typically achieved in England and Wales. For example, the operating expenditure reported by the companies, and used in my benchmarking, includes the cost of providing higher standards of water treatment than in Scotland. It is therefore not appropriate for me to determine an additional allowance for water treatment costs in Scotland.

n) 'Spend to Save'

I have used the term 'Spend to Save' to describe additional funds, which I am allowing within the authorities' revenue cap. These are to be spent by the authorities on initiatives that will reduce their costs going forward, and help them to achieve the efficiency targets. These additional funds, in my view, are a necessary expense and a justifiable investment in the future.

I believe that this Spend to Save allowance will greatly assist the industry in meeting the efficiency targets. I am aware, however, that in England and Wales no similar allowance was made available through customers' charges. The water companies had to fund any similar initiatives by outperforming Ofwat's targets.

I have estimated an appropriate allowance for Spend to Save through an iterative process. I first asked the authorities to submit Strategic Business Plans in my WIC 8 letter. I asked each

of the authorities to detail and to cost the Spend to Save initiatives that they would implement in order to achieve the operating cost targets.

I sought further information on the Spend to Save plans of the authorities in my WIC 12 letter. This included a request for a detailed justification of the expenditure, and a description of the appraisal process.

I have sought to match the Spend to Save allowance with the scope and phasing of the target for operating expenditure efficiency. The industry is actually able to spend more on operating costs in 2002-03 and 2003-04 than I would otherwise have allowed. The Spend to Save allowance in each year is greater than the operating cost efficiency target. I am, therefore, convinced that the industry has adequate resources to implement the initiatives that they regard as necessary to achieve the efficiency targets.

Section 2: Chapter 8
Methodology: Capital Expenditure Efficiency

a) Introduction

In this chapter I explain how I assessed the authorities' relative efficiency on capital expenditure and how I determined appropriate targets for improvement. As discussed in the previous chapter, improved efficiency means delivering the same or better levels of service for customers at lower cost, rather than simply cutting costs.

b) Approaches to analysing capital efficiency

My initial view was that the Ofwat methodology would be equally effective in Scotland. There were several potential attractions:

- It is an approach designed specifically for the water industry.
- It allows me to benchmark trends in Scotland with England and Wales.
- The capital and operational efficiency assessment processes of Ofwat are necessarily complimentary. I consider that there could be a risk of double-counting, or indeed not counting potential for efficiency, if the approach to capital efficiency had differed significantly from that used by Ofwat.

I have reviewed the techniques used by other regulators. This confirmed my initial approach.

i) Office of the Rail Regulator (ORR)

ORR does not set capital efficiency targets. Its Periodic Review allows for a base level of investment to cover maintenance, and there is a framework in place for negotiating enhancements to the network on a contract by contract basis.

ii) Office of Gas and Electricity Markets (Ofgem)

Ofgem relies on modelling of the capital investment programmes. For the electricity industry it analyses enhancements to the distribution network separately from maintenance of the network.

- Load related expenditure – this is investment spending associated with the connection of new customers to the distribution system and reinforcements to the existing system to accommodate growth. Analysis has focused on modelling load related expenditure to arrive at an independent assessment of expenditure requirements that is applicable to all companies.
- Non load related expenditure – this is investment spending directed at the replacement of life expired assets and expenditure on network control, information gathering facilities and improving quality of supply. Non load related expenditure allowances are based on modelling of asset replacement requirements using historical information about replacement levels, unit costs and asset age profiles. By benchmarking the companies in terms of number of assets to be replaced and unit costs, Ofgem was able to determine the levels of expenditure expected to result from the application of best practice across all companies.

This approach is not materially different from that used by Ofwat in assessing the serviceability of the distribution network.

c) Ofwat methodology

i) Introduction

Ofwat has a duty to ensure that the industry is properly financed, i.e. that the companies have sufficient resources to meet their environmental and public health obligations and to maintain effectively their existing asset base. Ofwat also has to ensure that the customer pays a fair price for the service that is provided.

Ofwat's approach to capital efficiency mirrors its approach to operating cost efficiency. The capital efficiency targets assume that relatively inefficient companies will substantially catch up with the more efficient companies, and that all companies have the scope to make further improvements. Ofwat ensures that relative performance is published. This increases stakeholder pressure on management to perform.

Ofwat uses its 'June Return' to collect information on the assets of the companies. This is complimented by the Asset Management Planning process (the English and Welsh equivalent of the Quality and Standards process), which provides details of the spending required to meet the outputs required by the Environment Agency and the Drinking Water Inspectorate. The information provided by the companies is audited both technically and financially by Reporters who work for Ofwat.

ii) Targets

Ofwat makes three adjustments to capital spending estimates of companies in order to ensure that price limits reflect the scope for improved capital efficiency:

- A scope and consistency challenge - Ofwat applies a 'scope and consistency' adjustment to each company's planned quality enhancement investment programme. This is informed by the views of the Reporter on the level of risk adopted by the company.

- Cost base catch-up analysis - Ofwat compares the comparative efficiency of companies in procuring and implementing their capital programmes. Ofwat uses this to set target capital efficiency improvements for each of the less efficient companies. The aim is to narrow the gap with the more efficient companies. Ofwat defines the extent to which the efficiency gap can be narrowed in capital maintenance by means of both the cost base analysis and econometric modelling of the companies' capital maintenance expenditure.

  Ofwat assumes that companies will be able to close 75% of the gap with the most efficient companies in their quality enhancement programmes and 50% of the corresponding gap in their capital maintenance programmes. This is designed to ensure that a well-managed company will do better than its target and will therefore be able to benefit from its outperformance.

  In 1994, Ofwat assumed that companies would achieve the catch-up efficiency assumptions evenly over the five-year price limit period. In 1999, Ofwat assumed that all the savings were achievable in year one, reflecting the fact that many companies were able to outperform the targets early in the five-year period.

- Cost base efficiency frontier movement - Ofwat assesses the potential for efficient companies to improve their efficiency further, especially as a result of improved purchasing methods, operational practices and technological developments.

  The Babtie Report, *Report and opinion on the scope for widescale adoption of lower cost new technologies and practices in the water industry,* was used to compare the current availability of low cost technologies and practice with the position at the time of the 1994 Periodic Review. The evidence showed that there were significantly more low cost technologies in 1999 when compared with five years previously. This demonstrated that there had been scope for continual improvement in efficiency during the last five years, and was used to inform the potential for improvement during the next five years.

  The Report estimated that the savings could be as high as 8% to 16% over the period. It seemed that a prudent view of savings from 5% to 10% savings over the period was a reasonable expectation.

  Ofwat assumed that the efficiency frontier would move forward by at least 1.4% per annum for capital maintenance and by a higher figure of 2.1% for capital enhancement. The higher figure for capital enhancement is justified since it should be possible to take full account of emerging technology with new investment.

  Ofwat assumes that this potential is available to all companies and therefore each company's capital efficiency target includes an element for innovation.

iii) Incentives

Ofwat seeks to set targets that a well-managed company should be capable of beating. This outperformance can increase the regulatory return available to the shareholder. Ofwat trusts that this scope for outperformance and superior returns will focus management's attention on delivering the service at the lowest possible cost.

d) Revised Ofwat methodology to suit the Scottish situation

In Scotland, there is no role for Reporters in the current regulatory framework. There is, therefore, no independent scrutiny of the absolute need for each investment project. I have used the conclusions from the Information Project and industry consultation to assess the current position of the authorities in terms of strategic asset management and programme planning. This replaces Ofwat's 'scope and consistency' challenge.

My approach in Scotland has also had to take into account the limited information available at the current time on trends in performance of assets. I have been unable to complete econometric modelling on capital maintenance as the asset trend information is not available. I have had to rely solely on the cost base and long run normative charge analyses in this area.

I have applied the Ofwat methodology on the cost base analysis. However, I have adjusted the rate at which the Scottish industry is expected to reach the Ofwat benchmark company. I discuss this in more detail below.

I also look beyond the cost base for capital efficiency and my analysis takes account of the potential not just of procurement but also of asset management and programme planning. My targets have taken account of each stage of the capital investment process. I am confident that this process has identified the scope for efficiency.

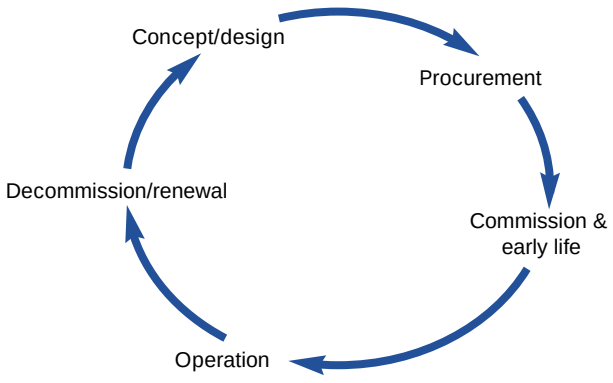
e) Approach

i) Introduction

My starting point in assessing the scope for capital efficiency improvement was to study the asset lifecycle. I separated the capital investment process into a series of discrete steps or 'building blocks'. This allowed me to assess the potential for efficiency at each step.

I started by dividing the lifecycle of an asset into five distinct phases: concept and design; procurement; commissioning and early life; operation; and decommissioning/renewal.

Figure 8.1: Lifecycle of an asset



Each phase involves different decisions or actions by those who are managing or operating the asset. I have to review each phase in order that I can understand where costs are incurred throughout the asset's life. This allows me to identify where the potential for efficiency lies.

I have looked for efficiencies across four broad areas, which cover all steps of the asset life cycle.

- Strategic asset management – 'saving by not doing'. These are savings that can be achieved by simply not spending the money that was allocated. It is essential to bear in mind that not spending would only be considered to be an efficiency if this were done without compromising output and performance measures. An example would be replacing pumps every five as opposed to every three years.

- Programme planning or investment appraisal – 'doing it better'. This area of analysis would question whether the projects deliver their objectives in the most cost-effective way.

- Procurement – 'buying it smarter'. This is the application of the cost base analysis described above. The aim of this analysis is to assess the opportunity for procurement savings by comparing the prices paid by the full range of companies and authorities for standardised capital projects.

- Innovation – 'doing it the new way'. This analysis assesses the scope for innovation efficiency by comparing the impact of low cost technologies with current practice. It may also suggest slightly different operating practices which could remove or limit the need for capital investment.

ii) Scope for efficiency

My approach to measuring the scope for capital efficiency was to combine quantitative evidence from the cost base analyses with other qualitative information that was available to me. These qualitative sources included the results of the Information Project, consultations with stakeholders in capital intensive industries, third party research and analysis from other regulators.

Table 8.1: Methods for assessing capital efficiency

Area identified for efficiency	Tools
Strategic asset management	Information Project; industry consultation/benchmarking
Programme planning (appraisal)	
Procurement	Cost base analysis
Innovation	Babtie Group Report

Information Project

The conclusions of the Information Project confirmed that there was considerable scope for efficiency in strategic asset management and performance planning. I have described the conclusion of the Information Project in more detail in Chapter 3.

Industry consultation

My office and I met with a number of companies, other regulators and trade associations to ascertain what had been achieved in terms of capital efficiencies in the areas of planning, procurement and management. We met with the organisations listed in Table 8.2.

I used a standard questionnaire to ensure that I could make proper comparisons between the various organisations. The planning questions covered:

- whole life costing,
- project appraisal,
- project cost estimates,
- internal audit.

My discussions also covered methods of procurement and organisations' views on framework, partnering and other solutions. I was also interested in the number of contractors each organisation used.

Industry benchmarking

I have reviewed in some detail the achievements in capital efficiency of the privatised companies in England and Wales since 1989. This has been important to my analysis of the potential efficiency for the Scottish water industry. I have not identified any reason why the Scottish industry should not be at least as efficient.

Cost base analysis

I used the cost base analysis to assess the gap in procurement efficiency between the authorities and the privatised companies in England and Wales. My analysis largely follows the methodology devised by Ofwat. This methodology was scrutinised in detail in August 2000 by the Competition Commission.

I asked each of the water authorities to prepare a cost base on the same basis as that submitted to Ofwat by the companies in England and Wales. I separately developed a model that benchmarks the authorities' unit costs against the Ofwat benchmark costs and which accounts for the relative importance at each element of the cost base in the capital programme. This means that if, for example, the unit cost of a 600mm water pipe is 50% above the benchmark, the 50% will apply only to that proportion of the programme represented by 600mm pipes.

Table 8.2: Organisations met during industry consultation

Privatised water companies	Other utilities	Other asset intensive industries	Other regulators	Industry associations/ contractors	Investors and consultants
Anglian Water	BT	BAA	CAA	ACE	Andersen
Northumbrian Water	Scottish Power	Exxon	Ofgem	AMEC	Cap Gemini Ernst and Young
Severn Trent Water	Scottish and Southern		Ofwat	CECA	Deutsche Bank
Yorkshire Water	Yorkshire Electricity			Hyder Consulting	Ernst and Young
Welsh Water				MJ Gleeson Group plc	Merryl Lynch
					Schroder Salomon Smith Barney

I received the cost base submissions between March 2001 and June 2001. I entered the standard costs into my model and compared the results with the Ofwat benchmark costs. This produced a set of percentage gaps between the authorities' unit costs and the Ofwat benchmarks for water infrastructure, waste water infrastructure, water non-infrastructure and waste water non-infrastructure.

The cost base of the authorities and the Ofwat benchmark costs were not strictly comparable. I also had to take into account the rate of improvement of the privatised companies.

Current data compared with 1998 benchmark

The Ofwat benchmarks relate to costs collected by Ofwat in June 1998. I therefore had to adjust the percentage gaps from my model to reflect improvement by the privatised companies between 1998 and 2001.

I assumed that the benchmark costs in England and Wales fell by 2.5% nominal per annum over the 30-month period from October 1998 to March 2001. I based this on my meetings with a range of stakeholders in capital intensive industries.

My assumption that the costs would have dropped by 2.5% per annum is supported by Ofwat's report, *Capital works unit costs in the water industry*, published in 1999. This showed that capital unit costs had fallen by 10% in the water industry between 1994 and 1998.

I used October 1998 as a starting point and not June 1998 because the companies in England and Wales resubmitted their costs in April 1999. Using the October date was therefore an attempt to average the cost base submissions.

Increasing the efficiency gap

Past experience would suggest that it is likely that the privatised companies will continue to improve their level of capital efficiency. If the water authorities were not to act to improve their efficiency, the gap between their current performance and that of the privatised companies would grow between now and 2005-06. For reasons of prudency, I have assumed that the companies in England and Wales will continue to reduce costs no faster than the historic level of 2.5% per annum. Given the extent of investor pressure on managements within the sector at the current time, this is likely to be a conservative assumption.

Regulatory gaming

It is often argued that the regulatory system in England and Wales is subject to, and indeed even encourages, regulatory 'gaming'. As the companies earn a return on their regulatory capital value, they might be incentivised to maximise their capital value by overstating investment needs, including capital unit costs. There is some evidence based on the cost base submissions from the companies and the water authorities, which would suggest that the costs submitted by the companies for projects that were added to their regulatory capital value were relatively higher than those that were expensed through the profit and loss account.

Potentially the capital efficiency gap between the water authorities in Scotland and the privatised companies in England and Wales is understated by the cost base analysis. In order to ensure that I do not overstate the margin for improvement in Scotland, I have chosen to disregard the likely gaming.

Innovation: Babtie Report

I discussed the Babtie Report *Report and opinion on the scope for widescale adoption of lower cost new technologies and practices in the water industry* earlier in this chapter. I have chosen to apply the same 1.4% per year target for innovation that Ofwat applied.

Discussion with stakeholders

I have held a number of meetings with management of the authorities to discuss my methodology, and to consider management's understanding of the efficiency gap and where potential areas for efficiency may lie. I presented the initial results of my findings in May 2001 to a meeting with the senior management of the authorities, the Scottish Executive and the Scottish Water transition team, which has been set up by the Scottish Executive to manage the proposed merger integration process. I then arranged meetings with each authority to clarify any particular areas of concern. Subsequently, each authority has agreed that the targets are achievable.

I have met with SEPA and the Scottish Executive (in its role as Drinking Water Monitor) on several occasions. We are all committed to ensuring that the level of outputs will not deteriorate as a result of my efficiency targets.

Setting the target

My target for capital efficiency is robust and draws on extensive qualitative and quantitative evidence. The target reflects the evidence from the cost base, from the Information Project, from industry consultation and benchmarking and from the Babtie Group Innovation Study.

The cost base analysis clearly establishes a significant gap in procurement efficiency. I have conservatively assumed this gap to be at the lower end of the possible range suggested by my analysis.

It is more difficult to quantify the potential savings in asset management and strategy. This is partly due to the limited quality of asset information in Scotland and partly due to the fact that there is no established methodology applied by Ofwat or any other regulator. I would need to understand the risk profile (on a fully comparable basis) that is being run by each of the companies or authorities in order properly to quantify the scope for asset management efficiency.

I have therefore assumed that all non-procurement savings, required of the privatised companies within their agreed price limits, relate to asset management and programme planning.

The opportunity for asset management efficiency is the net result of the total efficiencies required in England and Wales less the efficiencies identified through my assessment of the impact of innovation and the potential for procurement efficiency. I have made three assumptions to reach a final conclusion on the scope for asset management efficiency.

- I have assumed that the gap in cost base efficiency between the Ofwat comparators and the Scottish industry has appeared since privatisation of the water industry in England and Wales. There is assumed to have been an 11.9% gap in procurement built up by 1995 (-2.5% per annum over five years).
- The procurement gap is assumed to be 20% at 2000-01. This is consistent with both the comparisons of my model against Ofwat benchmark costs at 2000-01 and the assumption that the private companies are reducing costs by 2.5% per annum.
- Capital efficiency savings that have resulted from privatised companies delaying projects have been excluded from cumulative efficiency calculations.

The efficiency percentages are multiplicative, not arithmetic. This means that two 20% savings do not equal 40% (i.e. 20%+20%), but equal 36%. This is calculated by the formula 1-[(1-x) (1-x)], where x is the efficiency percentage.

Application of the target

I have set targets on the basis that the Scottish water industry should be capable of narrowing 80% of the estimated capital efficiency gap. This is consistent with my approach to merger savings and operational cost efficiency.

The capital efficiency target percentages have to be applied to the capital spending of the water authorities. The Quality and Standards programme costs represent both the hard capital costs and the capitalised labour costs incurred in the delivery of the investment programme. I have reviewed the past several years and identified that approximately 8% of total capital spending is accounted for by capitalised labour. I am therefore applying the capital efficiency targets to the 92% of the capital programme that remains after removing capitalised labour.

I expect the water authorities to make the same efficiencies in capitalised labour as I have set for operational costs.

I have also not included any efficiency targets on Spend to Save resources that are being made available to the water authorities.

My calculation of the efficiency target is outlined below:

Efficiency target =
92% of authorities' total investment (£m) multiplied by 80% of assessed capital expenditure efficiency gap (%) plus - 8% of authorities' total investment multiplied by 80% of assessed operating cost efficiency gap (%)

I have also not applied an efficiency target to PPP projects. These projects do have an impact on levels of capital maintenance and operating cost allowances for assets. My approach still includes these assets within the authority and allowances are available for them. This factor certainly means that I am understating the efficiency gap.

Phasing of the targets

In its 1999 Periodic Review, Ofwat assumed in its cost base analysis that the companies would be able to meet the capital efficiency targets in the first year. However, I have recognised that although efficiency savings can be identified in the early stages of each project, they are not fully realised until the later construction stages.

I have chosen to delay non-essential capital spending. This does not impact on any environmental or public health deadlines. I have also placed the achievement of the capital efficiency targets over the full four years. Both these assumptions should help the authorities to outperform the targets that I have set.

f) Prudent approach

I have consistently made assumptions that favour the authorities. These include excluding Spend to Save and PPP from efficiency targets. There are a number of other assumptions that also benefit the authorities. These are listed below:

- I made no allowance for any additional potential for capital efficiencies that could result from the proposed merger of the authorities.
- I have assessed the efficiency gap relative to the Ofwat benchmark and not relative to the leading companies.
- I have restricted my analysis to the water industry. If I had benchmarked against achievements in other industries, such as electricity, the gap would increase significantly.
- I have allowed the authorities four years to achieve 80% catch-up with the benchmark in the cost base analysis. Ofwat allows only one year, and the Competition Commission only extended this to three years for the two small water companies that appealed against the Ofwat determination.
- I have made no allowance for 'gaming' by the companies in England and Wales in the reporting of their capital unit costs.
- I have made no allowance for outperformance by the companies of the 2000-05 Ofwat determination.

I believe that these favourable assumptions ensure that my targets are prudent. I am confident that good management will outperform these targets.

Section 2: Chapter 9
Methodology: Merger Savings

a) Introduction

The potential for savings that would result from the creation of the proposed Scottish Water seem likely to be significant. There are obvious benefits such as scale and scope and it is therefore important that the benefits of the merger be quantified and that customers receive the benefit.

I am setting a 'merger efficiency' target for two reasons. Firstly, the operating and capital efficiency targets for the individual water authorities do not take any account of the potential created by the merger. Second, there has been no evidence of effective collaboration prior to the announcement of the intention to create Scottish Water by Sam Galbraith, MSP, in February 2001.

I make no effort to quantify all of the efficiencies that would result from the creation of Scottish Water. I attempt to quantify only those savings that become possible as a direct result of the merger. I have therefore striven to ensure that there can be no question of double counting the potential for efficiency.

I have limited my analysis to operational cost savings. In many ways, I believe that there is a strong case for extending the search for savings into the capital spending arena. There would certainly seem to be a considerable amount of empirical evidence that would support the existence of lower unit costs in procurement and capital management within a larger organisation. The Michael Porter competitive strategy framework also explicitly identifies buyer power as one of the main drivers in determining the behaviour of markets (see Chapter 6). There is, however, insufficient reliable data available on how capital costs have changed as a result of mergers. I have therefore decided not to include this undoubted potential in my target for merger efficiency.

There is also clearly potential for an on-going rationalisation of the properties owned by the water authorities. Although this is not a true efficiency in the definition used elsewhere in this Review, I have tried to make a reasonable estimate of the scope for these disposals over the period 2002-06.

b) Approaches to analysing merger efficiencies

I have considered the potential for merger efficiencies in three ways. To each of these options I have added my estimate for the proceeds that could arise from the disposal of property.

i) Assessment of the potential merger savings of the enlarged authority, based on an Ofwat model. This model was contained in the detailed evidence provided to the Competition Commission in the hearings on Mid Kent Water Ltd and Sutton & East Surrey Water Ltd.

ii) Assessment of the likely size of a single, efficient head office and support infrastructure, when compared with the post efficiency three head office and support service infrastructures. A further assessment was made using a higher average salary level, which better reflects the average remuneration in head office type functions and an increased per capita level of overheads.

iii) Assessment of the scope for merger savings based on a review of what has been achieved by the merger of other significant water and sewerage undertakings, in utility mergers, private companies and in the public sector.

I will review the process used for each of these approaches below.

i) Ofwat econometric models

The Ofwat econometric models provide a limited insight into the potential for scale and scope efficiencies. Re-running those models for the proposed Scottish Water would provide some insight into the potential merger savings. Economies of scale and scope are a feature of two of the models used for benchmarking operating expenditure efficiency in this Review, and are described in my earlier discussion of the calculation of operating efficiency targets. These two models cover the pumping costs for the water service and costs incurred on customer services, scientific services, doubtful debt and other business overheads.

The other models do not reflect any economies of scale. This is because in each of these cases, there were found to be explanatory variables that were more significant than scale. The other models rightly therefore restrict themselves to

stronger drivers of cost, associated with the asset base. One of the reasons why scale does not feature significantly, particularly on the sewerage side, is that there are only ten companies available for study in England and Wales and there is relatively little difference in scale between the largest and the smallest. This prevents any conclusive analysis of economies of scale for that area of activity. This does not mean that there are no economies of scale in the other activities; it simply means that, relative to the other explanatory variables, scale was not found to be amongst the most important. Savings from scale *could still potentially be significant.*

However, as part of its price review in 1999, Ofwat produced a separate, simple model, which was designed to estimate economies of scale for the water business as a whole. As noted above, the Competition Commission used (and one assumes therefore endorsed) this model when it examined two small water only companies that had appealed against Ofwat's price determination. No such model exists for the sewerage service, due to the limitations mentioned above, but there is no a priori reason to suppose that economies of scale are fundamentally different for sewerage. Indeed, it would seem strange that there are benefits, which would be available to a water only company, that would not be available to a theoretical 'sewerage only' company.

Ofwat's model for the water business is shown in Table 9.1.

Table 9.1: Ofwat model for the water service

Water service	Economies of scale
Data: June Return	**Modelled cost:** Log to the base e of total water service operating cost (£ million).
Explanatory variables	Coefficient
Constant	–2.6279
Log to the base e of the number of billed properties (000s)	0.9612
Form of model: Log to the base e of total water service operating cost (£m) = –2.6279 + Log to the base e of number of billed properties (000s) * 0.9612	

Applying this model, first to the three separate Scottish authorities, and then to the proposed Scottish Water, provides a pointer to the level of savings in operating expenditure available within the water service, that would arise from a merger. This calculation is shown in Chapter 20.

I have estimated the potential savings in the sewerage service by applying the same coefficient of economies of scale that apply in the water service model.

ii) Head office and support services efficiencies resulting from the merger

The focus of my analysis of merger savings was on those activities that can be provided centrally to a larger organisation. Typically these are indirect, rather than direct, operating costs and would include areas such as administrative support, customer services and scientific services activities. This section covers both the base case and the case where a higher average salary level and higher overhead costs are assumed.

My analysis covers savings across five areas:

- labour costs (operating and capitalised),
- overheads operating costs,
- customer services operating costs,
- scientific services operating costs,
- asset disposals.

I used regulatory letters to request information on each of the above areas. My WIC 20 (Request for data relating to depots, labs & office buildings) and WIC 21 (Critical information for Strategic Review, special factors and queries on June Return submission) letters are the principal sources of information. There is also significant information provided in the annual regulatory return, which has also been useful in quantifying the realistic potential for merger savings. I have also taken some information from the annual report and accounts of the three authorities and I have discussed a number of issues with staff members of the authorities.

Labour costs (operating and capitalised)

Head office and support services costs tend to be dominated by the cost of employees. This cost appears both in terms of salary and related costs and in terms of office and other overhead costs. I have therefore designed a methodology to

identify what savings may be available as a result of the merger of the three authorities. My starting point was the responses by the water authorities to my WIC 20 letter on staff numbers employed in head office roles. I subtracted from these totals costs associated with call centre and laboratory staff. This information came from responses to my WIC 21 letter.

I added to these sub-totals the staff engaged in head office type functions (e.g. human resources), who are based at regional offices. I have also added back design, investment, data management and asset planning roles.

This results in a total staffing level for the three Scottish authorities in head office functions. As emphasised above, I am keen to ensure that there is no element of double counting and I am therefore making an assumption that total staff numbers would have been reduced by about a third as a result of the efficiency targets, to which each of the three authorities has separately agreed.

I therefore made a 35% reduction to adjust for pre-merger efficiencies. I estimated an average annual salary cost by referring to each authority's General and Support Employment Costs information provided in their annual regulatory return. Specifically, I used the information provided in the E1b (activity-based costing – water services) and E2b (activity-based costing – waste water service) tables. I have also added to this total the capitalised employment costs.

I calculated an average staff cost per head by dividing the total amount spent on salaries by the total number of people employed in indirect operating roles. I would expect that this assumption would favour the authorities, as empirical review of data from other companies suggests strongly that head office staff employment costs are always relatively higher. I therefore also examined the savings that would result, assuming average head office salary levels were 15% higher than the average salary in an indirect operating role for each authority.

I assumed that it should be possible to reduce total head office staff by about 50% as a result of the merger of the three authorities. My assumption is that the workload of this single authority will amount to half that of the current operations. This potential reduction in headcount was then multiplied by the labour saving per head figure and a compound inflation rate of 2.5% for five years applied. This inflates the current saving by 13.1% to arrive at its 2005-06 value.

Overhead operating costs

The calculation of an overheads savings figure followed much the same process as the labour savings calculation. I have taken the General and Support Other Costs information from the annual return provided by the water authorities. Specifically, this comes from E1b and E2b tables. This total is reduced by 35% to separate out the efficiency drive currently underway in each of the authorities separately. Again, this has been done to ensure that I would not double count the potential for savings. I have then multiplied this total by the percentage potential reduction in head office staff. This number has again been inflated at RPI in order to calculate the efficiency available in 2005-06 money. As with labour costs, I also examined the savings that would apply were head office overhead levels 15% higher than the average for each authority.

Customer services operating costs

I have made use of the responses to my WIC 21 letter in calculating the savings available in this area. The areas considered include call centres, IT expenditure relating to head office, rent and rates relating to head office and travel and other expenses for head office staff.

For all travel expenses and salary related items, the figures were totalled and reduced by 35% (as above to reflect the current single authority targets). I have again assumed that the single head office would be 50% of the size of the three (more) efficient head offices and, therefore, I have estimated savings of 50% in the reduced expenditure figure. The current value of the savings is then inflated to reflect their 2005-06 value.

The items relating to Other (IT, hardware, software, peripherals, licences and helpdesk) and Indirect Support Costs allocation (share of rents, rates, electricity, etc.) were totalled and similarly reduced by 35% to reflect the single authority targets. I have again assumed a 50% reduction from

the merger of head offices. In addition, it is appropriate to assume a further 6% procurement saving on the single head office cost allocation. This reflects the advantages of scale in procurement. The value of these efficiencies was again inflated to 2005-06 prices.

The treatment of call centre costs was similar to that used for travel expenses, that is to say a 35% reduction to reflect single authority efficiency followed by a 50% reduction to reflect the move to a single authority.

Scientific services operating costs

The annual return E1b and E2b tables present the expenditure levels on scientific services. In addition to the 35% saving that should result from the separate authority efficiency target, I have assumed only a prudent 20% further saving. This saving has been limited by the fact that it may be proper to maintain more than one centre in Scotland for scientific services. The resulting savings have again to be inflated to take full account of inflation to 2005-06.

Asset disposals

The information to inform my assessment of the scope for asset disposals was provided by the water authorities in response to my WIC 20 letter. Whilst there would seem to be significant extra potential to dispose of short-life assets, these are excluded because they are not material in terms of disposal value.

I compared the property valuations submitted by East of Scotland Water Authority and North of Scotland Water Authority in their responses to WIC 20, with information on the current property market, which I obtained separately. West of Scotland Water Authority was unable to provide sufficient information on property values to allow a proper initial comparison.

The independent valuations were generally much higher than the authorities' estimates, but I decided it would be prudent not to adjust the authorities' estimates in my analysis.

I then calculated the ratio of property value to numbers of employees at each location, and in the case of West of Scotland Water Authority, substituted the ratio calculated for East of Scotland Water Authority. I was able to estimate, using the calculated ratios, an indicative value for the assets that could potentially be sold, given the likely achievement of my efficiency target.

iii) Review of what has been achieved in other mergers

In trying to achieve the right balance between achievability and challenge, I wanted to review the levels of merger savings reported in practice, from the water and sewerage companies, other utilities, the public sector and the broader private sector.

I obtained information from a variety of sources, including:

- City analyst reports,
- annual reports and accounts,
- water company staff,
- company announcements.

The information came in a variety of forms, and in order to obtain meaningful comparisons, I decided to calculate savings attributed to mergers as a percentage of turnover. In a few cases, operating cost was the only valid measure against which to gauge merger savings, and was used instead of turnover.

I was then able to compare the results of the various methods used to estimate the scope for merger savings, on a like for like basis, to assess how robust my target was.

c) Caution in target setting

I have adopted a conservative approach in my assessment of the scope for merger savings. However, I wanted to be sure that there could be no question about the achievability of my target. I therefore decided to base my target on achieving 80% of the assessed scope for merger savings. This is in line with my approach to capital and operating cost efficiency. I have, however, balanced this favourable assumption for the authorities with the judgement that the full target for asset disposals should apply.

Section 2: Chapter 10
Methodology: Financial Modelling

a) Introduction

This chapter describes the financial model used to calculate my recommendations on revenue caps.

I explain how I developed and tested the financial model and outline how the model works. I then explain the process used to verify the model. Finally, the chapter sets out how I dealt with risk and uncertainty in my assumptions.

b) Need for financial modelling

The main aim of my Review is to recommend annual revenue caps for the authorities and/or the proposed Scottish Water. I have to be sure that my recommendations are consistent with the medium- and long-term needs of the industry and are consistent with the interests of customers. I do not want simply to swap present problems of under-investment for financial problems tomorrow. I have therefore developed a sophisticated financial model, which is capable of analysing a range of different potential outcomes.

c) Scottish context

I have ensured that the financial model is consistent with the requirements of the Scottish Executive's resource budgeting. The model also includes the fees associated with PPPs as a separate line item. Spend to Save is also identified separately.

The model allows me to set a revenue cap that is consistent with public expenditure constraints and various profiles of investment and efficiency. I can also vary the extent to which efficiency targets are achieved.

d) Development of the financial model

I first built a simple spreadsheet model, which permitted me to understand the impact of investment, borrowing and levels of efficiency on the charges faced by customers. This model is deliberately simple and has played two roles. It is a useful check on the answers generated by the full model. It has also been used to run the risk analysis.

This initial model included only a relatively narrow range of assumptions. These included:

- capital efficiency,
- operating cost efficiency,
- capital expenditure inflation,
- operating cost inflation,
- base operating costs,
- annual investment levels,
- prices for domestic and non-domestic customers,
- non-domestic revenue retention scenarios.

I could only model one scenario in this model.

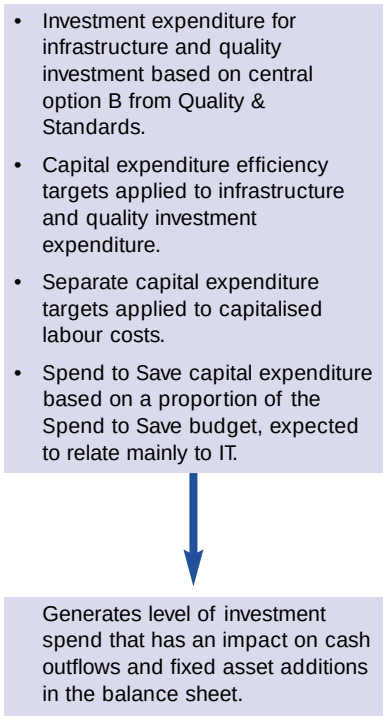
I also did not include the functionality to change working capital. The price increases and revenue retention scenarios were kept the same for each customer group and I did not separate the capitalised labour element of the capital spending.

The output of this model was a simplified income and expenditure statement and a cash flow statement.

I then built a first version of the current financial model that I used to calculate the revenue caps. This model was refined and checked by Cap Gemini Ernst and Young as one of the outputs of the Information Project. The model included a full set of assumptions, which covered all the parameters outlined below:

- operating cost inflation,
- capital investment inflation,
- depreciation and asset useful life,
- working capital,
- interest on new loans,
- existing loan balances including interest rate and maturity assumptions,
- investment over the period and investment phasing,
- operating cost efficiency targets,
- base operating costs,
- capital efficiency targets,
- capitalised labour scenarios,
- public private partnership expenditure,
- Spend to Save: operating costs,
- Spend to Save: capital costs,
- level of service increments,
- customer revenue retention,
- market growth,
- price increases.

Figure 10.1: Capital spending



The model also included a functionality that allows me to run a range of different scenarios. It is possible to model 720 different scenarios within one version of the model. This allows me to assess the impact on prices and public expenditure of all of these scenarios.

e) Output of the model

The financial model produces financial statements covering a period of 19 years. The model starts with the audited financial results of the authorities for the year 1998-99. The final year in the model is 2016-17. The financial information for the years 1998-99 and 1999-2000 is taken from the audited accounts. The financial information for 2000-01 is based on the F-Table of my annual return. The authorities have confirmed that these figures are consistent with their statutory accounts for 2000-01. The model then calculates the position for each of the years to 2016-17.

The output of the model is a set of financial statements. These are significantly more detailed than in the earlier, simple model. They include a full income and expenditure account, balance sheet, cash flow, loans breakdown, assets and depreciation schedule and a summary of key performance criteria.

f) Model inputs: balance sheet and cash flow items

i) Capital investment

I have split capital investment between infrastructure investment and other investment. This is in line with the central option of the Quality and Standards programme. Infrastructure investment covers the annual expected expenditure to maintain the infrastructure. The other investment category relates to 'quality' spend. I have divided the total between the expected useful lives of the assets to be created. I have phased the capital expenditure to generate the most favourable price profile for customers and to ensure that there is no risk to the public expenditure constraint.

I have applied capital efficiency targets to my profile of capital expenditure. These targets are in line with those agreed with the authorities in May/June 2001. I have set a separate efficiency target for capitalised labour costs. This target is the same as the target that I set for operating costs.

ii) Spend to Save

I also expect that a proportion of the Spend to Save allowance that I am making available to the water authorities will be in the form of capital. I have assumed that this is 25% of the total allowance. The useful life of assets created by Spend to Save capital spending will be three years. I have not applied any efficiency target to the Spend to Save allowance. I have allowed the majority of the Spend to Save allowance in the first two years of the Review period. I expect the authorities to want to make quick progress in achieving the efficiency targets and my phasing of Spend to Save reflects this.

iii) Other assets and liabilities

I have calculated working capital ratios as a percentage of revenue. I analysed the historical ratios of the authorities to identify appropriate assumptions. I have assumed cash at hand to be zero. I have likewise assumed no provisions from 2001-02 onwards. My assumption is that all 'normal' provision costs (e.g. pension holidays) are included in Spend to Save.

iv) Government and other loans

Government and other loans fund the deficit of customer revenue to the cash outflows. The cash outflows comprise:

- capital investment,

- net interest payments,
- changes in working capital,
- repayments of loan balances,
- operating expenditure.

g) Model inputs: income and expenditure account

The inputs to the income and expenditure account are outlined below:

i) Revenue requirement

I have calculated the revenue cap at the level that minimises the level of charges to customers and is consistent with a sustainable industry. I have therefore ensured that the industry has sufficient resources available to operate its existing assets to fund the capital expenditure necessary to maintain the existing assets and meet the improvements in level of service required by the Quality and Standards process. The revenue caps are on the basis that efficiency targets are achieved (unless I have assumed otherwise) and that the public expenditure available is not breached. The revenue increase is not the same as a price increase. The revenue reflects movements in the chargeable base of the industry and changes in price.

The revenue requirement is calculated as shown in Figure 10.3.

Figure 10.2: Cash flows

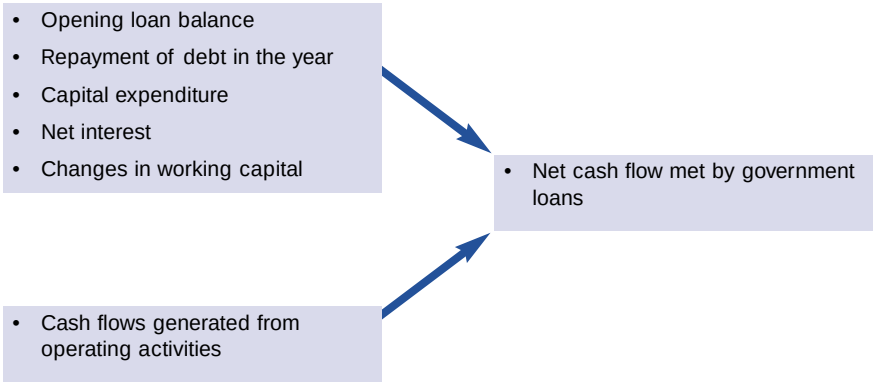
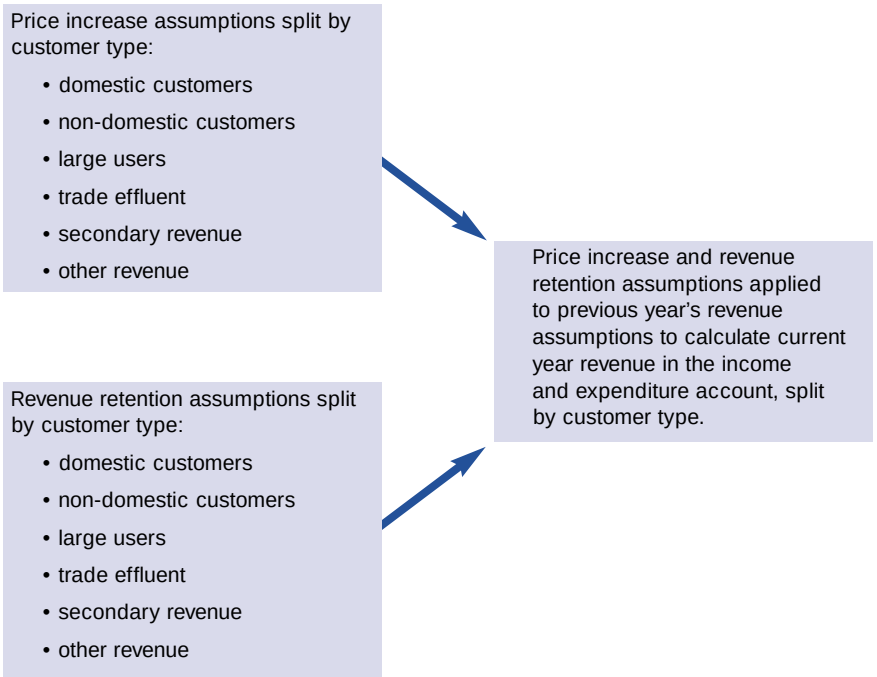


Figure 10.3: Revenue requirement



ii) Operating costs

Base operating costs

Base operating cost is the cost associated with providing the current level of service. The figure excludes the additional costs allowed for improvements in levels of service and growth. The base operating cost figure includes:

- manpower costs (excluding any capitalised costs),
- materials and consumables,
- other operational costs,
- bad debt,
- revenue grant.

I have used the year 2000-01 as the base year, since this is the most up-to-date information available on the authorities' current levels of operating costs. I have adjusted future years' base direct operating costs to take account of inflation.

iii) Efficiency targets on base operating expenditure

I have applied efficiency targets to base direct operating costs including inflation, but excluding the amortisation of grants and contributions. The efficiencies are phased to give management time to change current practices. The efficiencies to be achieved over the five years is the difference between the actual 2000-01 controllable operating costs and the 2005-06 costs that I have allowed.

Figure 10.4: Efficiency targets on base operating expenditure

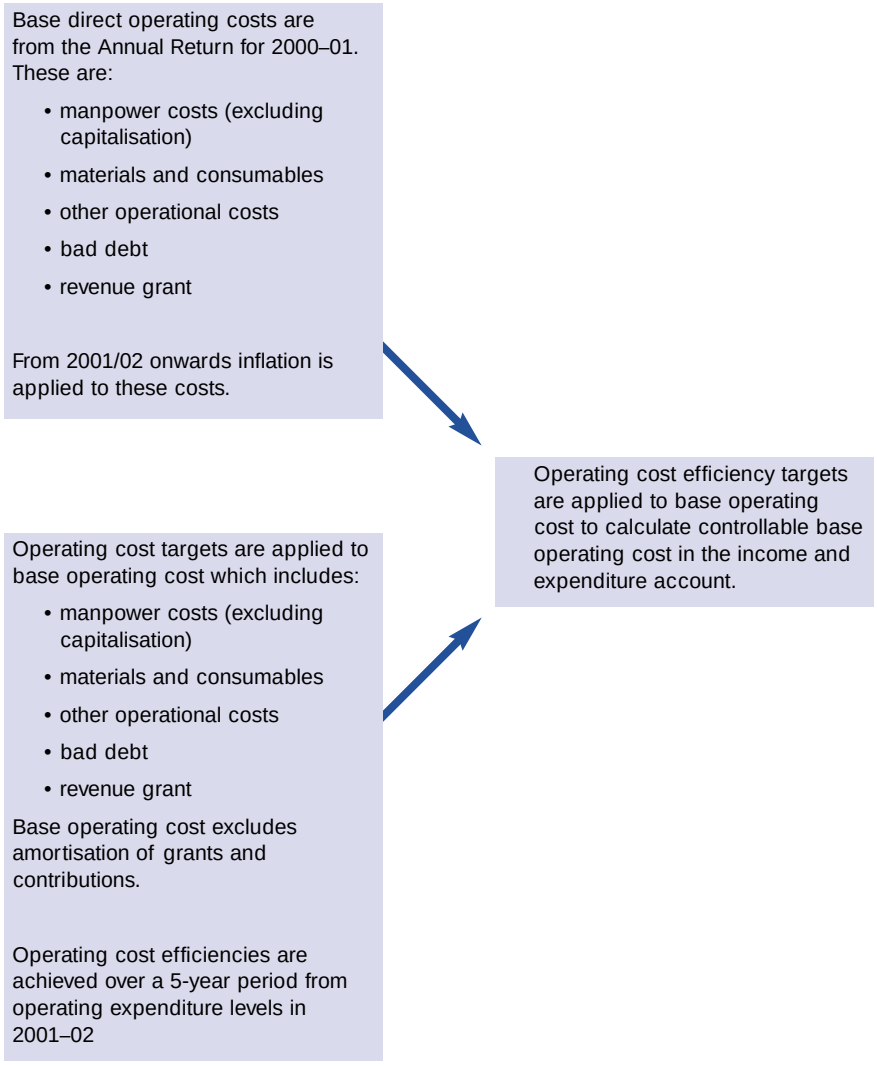
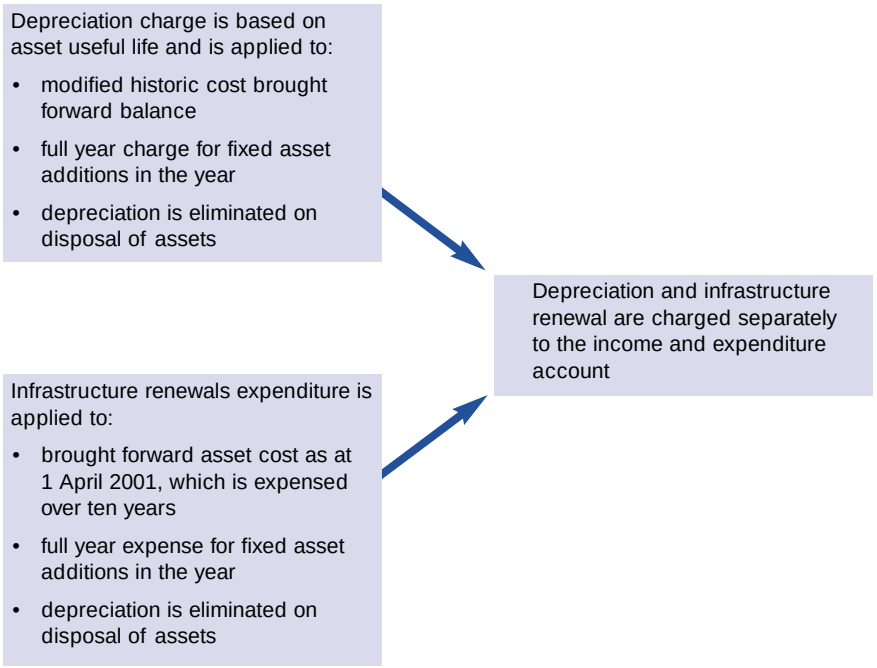


Figure 10.5: Depreciation and infrastructure renewal



iv) Other costs

Depreciation charge

I have calculated depreciation on the modified historic cost of assets (i.e. (opening cost + additions cost)* Construction Operators Price Index (COPI)).

I have charged depreciation in line with the expected useful life of the asset. I have therefore depreciated an asset with a four-year useful life at 25% per annum.

I have applied a full year's depreciation charge to all additions in their year of purchase. Effectively, I have assumed that all assets are purchased on the first day of the financial year.

I have eliminated accumulated depreciation on disposal of an asset. I have assumed disposal at the end of the asset's useful life. I have also assumed that the asset has no residual value at the end of its life.

I have based the depreciation revaluation on the existing accumulated depreciation increased by COPI.

Infrastructure renewals expenditure

I do not depreciate infrastructure assets. I charge the annual actual expenditure for maintaining the network's operating performance in the long run through the income and expenditure account. I have expensed any infrastructure balances as at 1 April 2001 through the income and expenditure account. I have done this over ten years to eliminate these balances gradually. I have charged any additional annual expenditure on infrastructure assets directly to the income and expenditure account in any year after 2002.

Interest payable

I have calculated the interest payable on both embedded debt and new debt. The allowance for interest payable takes full account of all debt service costs that prudent treasury management would incur. Interest on new loans is calculated at 4.8%, which is based on an expected real premium on debt of 2.3% plus estimated retail price inflation. New loans are equal to the gross cash outflow in the year. This comes from the cash flow statement. I have used the loans note in the authorities' report and accounts to calculate the interest costs of existing debt.

Table 10.1: Asset lives

Asset life	East	North	West[1]
Spend in the year (infrastructure)	Infrastructure assets	Infrastructure assets, aqueducts, dams, reservoirs, sea outfalls, sewers, sludge pipes, water mains	Infrastructure assets
1 year		Investigations, maps and network records	
3 years	Spend to Save, computer equipment	Spend to Save, computer equipment,	Spend to Save, computer equipment
4 years	Ship cost, vehicles	Vehicles, small commercial vehicles	Vehicles and plant
5 years	Fixtures and fittings	Loose tools, mobile plant	Fixtures and fittings
6 years	Large commercial vehicles	Large commercial vehicles	Vehicles and plant
7 years		Fixtures and fittings, laboratory equipment, other general plant and equipment	
10 years	Plant lighting, temporary buildings, telemetry equipment	Mobile plant and equipment, plant lighting, telemetry equipment, PFI assets	Vehicles and plant, control and instruments, leasehold improvements, telemetry equipment
15 years	Fencing, telemetry equipment	Fencing, operational structures	
20 years	Buildings lifts, filter media, plant gantry crane, process plant, pumps	Process plant, pumps	Mechanical/electrical operational property
25 years	Carparks, riverworks, telemetry equipment		
30 years	Spillways, steel towers		
40 years	Plant pipework, weirs	Filter media, lifts, overhead gantry cranes, river protection works, water towers (steel), weirs	Mechanical/electrical operational property
60 years	Buildings, land and infrastructure boreholes, bridges, catchwaters, concrete towers, operating buildings and structures, storage reservoirs, lagoons	Boreholes, bridges, operational and office buildings, inter-process pipework, roads and carparks, operational structures, water towers (concrete)	Buildings and civil operation property
80 years		Lagoons, service reservoirs	
100 years		Catchwaters, leased land	
Infinite		Land	Land

Exceptional/one-off costs

I have identified any exceptional and one-off costs for the years 1998-99 to 2000-01 from the authorities' audited accounts and from their annual returns. I have not allowed for any one-off costs from 2001-02 onwards with the exception of Spend to Save.

h) Accounting policies

I have prepared the model on a resource accounting and budgeting (RAB) basis for the years 2001-02 to 2016-17. The main impact of RAB on the financial statements relates to the revaluation of fixed assets on a modified historic cost basis.

I have applied COPI inflation to the asset value of the authorities at the start of their operations in April 1996. I have revalued assets each year to 2000-01. My model includes this cumulative revaluation from April 2001 as RAB took effect from that date. I have asked the authorities to submit cumulative revaluation figures. I compared the estimates of the authorities and my office and included the more conservative estimate. I revalue assets annually after April 2001 based on my estimate of COPI. I have made the following adjustments to take account of RAB:

- I adjusted the fixed asset net book value on the balance sheet to reflect the cumulative revaluation of cost and the additional depreciation on the revalued asset.
- I established a revaluation reserve on the balance sheet in 2001-02. I based this on the cumulative revaluation brought

[1] Operational property for West of Scotland Water Authority includes: clear water storage tanks, raw water storage tanks, service reservoirs, sewage pumping stations, sewage treatment works, water pumping stations and water treatment works.

forward as at 1 April 2001 and the revaluation in the year 2001-02. This reserve is adjusted each year.

- I reduced the income and expenditure reserve on the balance sheet for the accumulated depreciation resulting from the revaluation of assets as at 1 April 2001.
- I made an additional charge to the income and expenditure account to reflect depreciation on the revalued fixed assets.

I used the asset lives given in Table 10.1 in the model. The information for the asset lives was provided by the water authorities.

Tax would be calculated according to the rules on corporation tax. I have anticipated no tax charges during this regulatory period.

i) Verification of the financial model

My initial version of the model was reviewed and improved by Cap Gemini Ernst and Young. My staff have checked this final version of the model extensively over more than two months. A number of sensitivities have been calculated and a range of reasonableness checks made. Staff have also developed a detailed, audited trail to support the inputs to the model.

I asked Scott Moncrieff, a leading Scottish firm of Chartered Accountants, to audit the model. They found the model to be accurate in all respects and to represent fairly the challenges faced by the water authorities. Their report is attached as Appendix B to this Review.

j) Prudency and sustainability for customers

I consider the assumptions used in the model to be prudent. My intention throughout this Review is to challenge the management of the industry, but not to set unrealistic targets. I want to be sure that customers benefit over the long term and that problems are not simply delayed for another day. I believe that within the model there are a range of assumptions on working capital and on depreciation (for example, full year's depreciation in year of purchase) that are clearly prudent. This should help ensure that there are no unpleasant surprises being stored up for the future.

k) Application of annual inflation

I input all information to the model exclusive of inflation. The model then uses an input assumption to calculate the income and expenditure account, balance sheet and cash flow in outturn prices. The input assumption is based on the retail price index (RPI) for all inputs excluding capital investment. I have applied COPI to all capital expenditure and asset values.

l) Risks and uncertainties

i) Definition and rationale

I have included a range of scenario analyses to check the impact of my assumptions. This allows me to be confident that I have fully understood the range of potential outcomes. I developed scenarios that covered the following areas:

- bad debt,
- investment,
- efficiency,
- revenue retention,
- grant and capital,
- price/revenue.

The scenarios range from 1 to 5, where 1 represents the most pessimistic standpoint and 5 the most optimistic standpoint. Taking the example of non-collection of revenue:

- Scenario 1 - presents the view that the authorities' position is significantly worse with regard to the collection of revenue.
- Scenario 2 - the authorities are in a better position in relation to the collection of debt than in Scenario 1.
- Scenario 3 - this is the position in which I believe the authorities should be.
- Scenario 4 - this would put the authorities in a better position than I am expecting.
- Scenario 5 - is as good as it is possible to expect.

The scenarios are generated either from my review of other utilities or from information provided by the authorities. These scenarios can be combined in different ways in order to assess the sensitivity of the model to each scenario.

ii) Risk analysis

I was asked by the Scottish Executive to complete a formal risk analysis. I have used 'Monte Carlo' analysis techniques to examine all possible outcomes arising from a given set of uncertainties and to assign probabilities to those outcomes. I used the 'Predict! Risk Analyser' software package to complete this analysis.

The most material assumptions were those relating to the efficiency targets for operating and capital expenditure. I therefore applied my risk analysis to these elements, separately and in combination. I was particularly concerned to ensure that my recommendations on revenue caps would avoid undue risk to public expenditure limits, in the event of any underperformance of either or both efficiency targets.

I began my risk assessment by considering the range of possible outcomes on the performance against the efficiency targets. I adopted profiles of risk, related to different sets of circumstances. For example, I adopted a particular profile of risk for the possible circumstance that contracting out would feature significantly in pursuing efficiencies. For each profile, I determined a most likely outcome, in terms of percent closure of the efficiency gap, and a likely range of uncertainty around that figure. I then expressed these in the form of a mean and standard deviation of a normal statistical distribution.

For the Monte Carlo analysis, I used the simple version of the financial model described at the start of this chapter. It was not necessary to model the financial projections in detail in order to assess the extent of risk on public sector funding, and the risk analysis software was more readily adaptable to the simple financial model.

I applied the chosen profiles, expressed as parameters of the normal distribution, to the efficiency targets within the simple financial model. The projections of public sector funding under RAB accounting rules were then analysed statistically to define their risk profile. I was able to compare this output with the constraints outlined in the Minister's commissioning letter.