10 Regulation of water and wastewater

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1. INTRODUCTION

In this chapter we review the regulatory and economic framework of water utilities. First (in Section 2) we provide a general introduction and an overview of the industry, its economics and its legal/regulatory framework, focusing, in particular on the United Kingdom (UK). We then appraise the public policy framework for the economic regulation of the industry (in Section 3), and consider the economic principles and methods for regulation of the water industry (in Section 4). We then illustrate this by providing insights into the practical application of price regulation within the UK following privatisation (Section 5). Finally, we consider some of the emerging economic and regulatory issues facing the industry, including competition, the potential to establish a national grid for water and smart metering of water (Section 6).

2. OVERVIEW

2.1 Introduction

This section provides a guide to the main operational aspects of the water industry in general, and the key aspects of the industry within the UK in particular. First, we define the scope of the industry’s services, before investigating the components of the value chain. Other factors crucial to the industry, but not addressed specifically in value chain analysis – the need for capital investment, and to fulfil wider environmental obligations – are discussed. We then describe the ownership structure of water companies within the UK and the regulatory bodies that govern them.


2.1.1 Definition and core services

In this chapter, the 'water industry' is defined to include the organisations that provide potable water\(^1\) through pipes to households and businesses, and that remove and treat foul sewage and trade effluent from households and businesses.\(^2\) This includes all activities, from the abstraction of water from the environment, its treatment, and provision of potable water to consumers through water supply networks collectively (water supply) to the return of treated wastewater to the environment and the safe disposal of by-products (the wastewater cycle). The wastewater function also includes drainage of stormwater and the prevention of flooding. Figure 10.1 shows the activities undertaken by the industry in its value chain, along with an estimate of the breakdown of costs for each of the water supply chain and the wastewater disposal chain.

2.1.2 Value chain in the water industry

This section provides an overview of each segment of the value chain (as shown in Figure 10.1).

Abstraction  Water can be extracted from a variety of both groundwater and surface water sources.\(^3\) Extracted water is not only used by public water suppliers, but also by agricultural, private domestic, and industrial users.\(^4\) In the UK, a licence is required from the relevant environmental authority for the abstraction of any non-trivial amount of water from the environment. Such licences are usually granted where there is water available and there is a demonstrable need (Cave, 2009, p. 25). Licence charges are levied to cover the costs of the relevant environmental authority.\(^5\)

Treatment  Treatment for drinking water involves the removal of pollutants and pathogens to meet drinking standards. The level of treatment required depends on the composition of the source water and its intended use.

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\(^1\) That is, water suitable for drinking.

\(^2\) Trade effluent is industrial liquid waste discharged to the sewerage system. Domestic sewerage, from households and from domestic activities in businesses (e.g. from kitchens and bathrooms), is known as foul sewage.

\(^3\) In Europe, the majority of drinking water comes from groundwater sources; the vast majority of water used for industrial or agricultural uses comes from surface sources (European Environment Agency (EEA), 2009, p. 15).

\(^4\) According to the EEA, energy production accounts for 44% of total water abstraction in Europe, 24% is used in agriculture, 21% for public water supply and 11% by industry (EEA, 2009, p. 5).

\(^5\) Details of the relevant environmental authorities in the UK are given in Section 3.
Groundwater requires the least treatment, while the desalination of salt water is the most intensive and costly form of treatment. Chlorine is a commonly used disinfectant. Generally, treatment plants are located next to raw water sources.

**Distribution of potable water through pipes** Water is distributed through pipes from treatment facilities to customers. Potable water distribution networks are generally owned and operated by the water companies. This is the segment of the value chain for water services with the most natural monopoly characteristics, because it would be impracticable for a competitor to replicate the network of pipes (Cave 2008, p. 32). This is similar to the natural monopoly problem applying to gas and electricity distribution networks and, to a lesser extent, fixed telephone line networks.

**Retail** Retail activities include customer-facing activities such as billing, meter reading, and providing an interface for operational matters. In most of

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6. Technically, the water company’s network stops at the boundary of customer property, known as the connection point.
7. There are typically fewer interconnections between local water networks than between electricity and gas networks.
8. Arguably, the natural monopoly issue in telecommunications is less important than in the water industry because of the availability of alternative technologies, such as mobile telephony.
the UK, the retail function is provided largely by the statutory monopoly water companies. However, in Scotland, a separate company provides retail services to non-household customers, in competition with rival retailers.\(^9\) Some customers have water meters and pay a fixed charge, plus a volumetric charge at a rate per unit of water consumed (and of wastewater discharged).\(^10\) Customers without a water meter pay a fixed charge only, based broadly on the value of their property. Fixed charges contribute to the water companies’ fixed costs, which are a large proportion of their overall costs (see Section 4).

Wastewater collection and transportation Wastewater (i.e. domestic foul sewage and industrial trade effluent) is collected and transported through a network of sewers to wastewater treatment facilities. As with the water distribution network, this aspect of the industry exhibits natural monopoly characteristics. In many areas, water and sewerage companies are also responsible for surface water drainage.

Sewage and trade effluent treatment Sewage and trade effluent must be treated to a standard sufficient to meet environmental obligations for disposal of clean water back into the environment. Surface drainage generally does not need to be treated if it is collected and transported separately from foul sewage and trade effluent. The extent of treatment processes depends on the nature of the sewage (particularly the extent of trade effluent). In some cases the effluent can be treated to a suitable standard to be retreated for supply to consumers as non-potable water (often referred to as ‘grey water’).

Disposal By-products of the sewage treatment process (‘sewage sludge’) are disposed of through a variety of disposal routes, including selling to the agricultural sector for fertilizer, and incineration.

2.1.3 Costs and capital investment
The water industry is capital intensive. This industry spends substantial amounts on the maintenance and improvement of its capital assets. Once the assets are in place, the operating costs comprise primarily electricity (for pumping water and for treatment of water and wastewater) and chemicals (for treatment). Accordingly, the cost of providing the capacity to deliver water and wastewater services is relatively high, compared with the cost of actually

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\(^9\) Further details of the extent of competition and the economics of competition are set out in Section 7.

\(^10\) Usually, wastewater is not metered separately, but is charged for on the assumption that a fixed proportion of the measured water delivered is discharged.
delivering each unit of volume once the capacity is in place. For domestic customers, 70% of total supply costs for water distribution and wastewater collection comprise of fixed, and largely sunk, costs (Gee, 2004). For the average bill in England and Wales in 2009–10, 35% related to operating costs, while 65% related to the capital base (Ofwat, 2009b, p.33).\(^{11}\)

The aggregate value of the regulatory capital value (RCV) of the English and Welsh water companies stands at £48 billion in 2010 (Ofwat, 2009b, p.118). This measure is an important input into the price regulation process, described in Section 4. Notably, this is materially below a more traditional accounting valuation based on the estimated modern equivalent asset replacement value (‘MEAV’) less depreciation.\(^{12}\)

2.1.4 Environmental responsibilities

In addition to the important tasks of providing clean, safe, reliable drinking water, and treating the used water before returning it to the environment, the water industry is also responsible for compliance with environmental directives.

There are four principal areas of environmental impact: water extraction, waste management, energy consumption and the control of stormwater.

2.2 Ownership Structures

In the UK, there is a series of statutory monopoly water supply and sewerage companies, with one statutory water undertaker and one statutory sewerage undertaker allocated to each geographical area. These companies are granted a number of statutory powers and are subject to a prescriptive regulatory regime. Many of these companies are large, with average annual turnovers of the ten largest companies being nearly £1 billion (Ofwat, 2009b, p.152).\(^{13}\)

There are a large number of small non-statutory water suppliers and companies that treat wastewater and trade effluent. These are not generally subject to economic regulation.\(^{14}\)

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\(^{11}\) The 65% for the capital base includes 29% for capital charges (e.g. depreciation) and 36% for the return on capital invested (including interest payments, profit and tax).

\(^{12}\) In 2008, Ofwat stated the aggregate industry net MEAV to be £239 billion, compared to an aggregate RCV of £44 billion at the time (in 2006–07 prices) (Ofwat, 2008b, p. 45).

\(^{13}\) Ofwat states the aggregate revenue requirement of the ten WaSCs as £44 billion over 5 years. We therefore calculate the average annual turnover to be £0.9 billion, being £44 billion divided by five (for the five years), and divided again by 10 (for the ten companies).

\(^{14}\) With the exception that there is a statutory cap on the maximum resale price of water, which is always set substantially higher than the prices of the major statutory water undertakers.
Within the structure set out above, there are different ownership structures and statutory frameworks for each of England and Wales, Scotland and Northern Ireland.

### 2.2.1 England and Wales

In England and Wales, there are ten statutory water and sewerage companies (WaSCs), providing all of the services shown in Figure 10.1. These were privatised (i.e. sold by the UK Government and transferred from public to private ownership) between 1989 and 1990. A further 11 statutory water only companies (WoCs) provide water services alone. These were never in public ownership, but are covered by the same statutory framework as the ten privatised WaSCs. Customers served by a WoC receive sewerage services from the WaSC for their location.

At privatisation, all ten of the WaSCs were listed on the London Stock Exchange, joining a number of the WoCs that were already listed. Since then, there have been several mergers and takeovers as the industry consolidated, and only four WaSCs and one WoC continue to be listed: Severn Trent plc (which owns Severn Trent Water Ltd), Northumbrian Water Group (including Northumbrian Water and Essex & Suffolk Water), United Utilities Group plc (which owns United Utilities Water plc), Pennon Group (which owns South West Water Ltd) and Dee Valley Group plc (which owns Dee Valley Water plc).

Merger activity slowed in 2004 after a ruling by the Office of Fair Trading (OFT), one of the UK’s competition regulators, that a merger between any two water companies where at least one has a turnover of £10 million must be subject to clearance from the Competition Commission (the other UK competition regulator), on the grounds that the merger might inhibit Ofwat’s ability to regulate the water industry through comparative measures.

The status of Dwr Cymru, the company that serves the majority of Wales and some of Western England, is unusual in the industry; it is effectively mutally owned by its customers. Its parent company Glas Cymru has a special status as a company with no shareholders. This has returned the company to the status of being entirely debt funded. It appears that this 100% gearing has increased the company’s cost of debt. This may not be economically inefficient, as the economic regulator has not needed to allow a higher overall weighted average cost of capital for this company.

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15 WaSCs are companies holding appointments as both statutory water suppliers, and statutory sewerage undertakers.

16 These have consolidated from 29 WoCs in 1989 (Ofwat and Defra, 2006, p. 34).

17 See Cave (2009, p. 87) for a discussion of the effects of this regime.
2.2.2 Scotland
In Scotland, there is a single statutory water and sewerage undertaker, Scottish Water. This was formed in 2002 from the agglomeration of three regional water undertakers, under the Water Industry (Scotland) Act. Scottish Water was established as a publicly owned (i.e. nationalised) statutory corporation.

Scotland has led the way in introducing competition for the retail of water services. The Water Services etc. (Scotland) Act 2005 allowed the entry of several ‘licensed providers’ of water services into the market. These licensed providers can buy water wholesale from Scottish Water, and compete to supply non-household customers (i.e. businesses and public sector bodies). As at the current date (2011) five competing licensed providers are in operation. This arrangement does not apply to household customers. Household customers have their bills determined by Scottish Water, but revenue is collected, together with council tax, by the local authorities.

2.2.3 Northern Ireland
In Northern Ireland, there is a single statutory water and sewerage undertaker, Northern Ireland Water Ltd. This was formed on 1 April 2007 from the Northern Ireland Water Service (an executive agency of the government). As for Scottish Water, this is a nationalised entity, its sole shareholder being the Department for Regional Development in Northern Ireland.

Unlike in the rest of the UK, there are no charges for water and sewerage services to household customers in Northern Ireland (suggestions to introduce them were met with substantial political opposition). Instead, these services are funded out of taxation. Industrial and commercial customers are invoiced by Northern Ireland Water directly, but at present, only for two thirds of their notional bills, with the remainder being funded from local taxation. There are proposals to levy full bills from industrial and commercial customers, and to phase in charges for household customers gradually over a number of years.

2.2.4 International comparison
In contrast to the English model of large privatised companies providing water and waste water services, municipal ownership is common in many countries, including Canada (Ofwat, 2008c, p. 10), Germany (ATT, 2008), Italy (GWI, 2008), the Netherlands (Ofwat, 2008c, p. 10) and Spain. Similarly, in France, it is usually the municipalities that are responsible for provision of water services. To the extent that operations are contracted out in France, almost all the

19 The Water Industry Commission for Scotland maintains a register of all licence holders; see http://www.watercommission.co.uk/view_Register_of_licenses.aspx for an up-to-date list.
market is shared by just three companies (Conseil de la Concurrence, 2005). There have been investigations by both national and European competition authorities into the functioning of the French water market (La Gazette, 2010).

In Australia (Ofwat, 2008c, p. 9), water authorities are owned by state governments, and in Portugal a separate wholesale supplier is owned by the state, and supplies water to municipal authorities (Ofwat, 2008c, p. 11, ERSAR, 2008, p. 49). There is a wide variety of ownership structures in the USA, with privately owned utilities generally serving cities and suburban areas (Ofwat, 2008c, p. 11).

### 2.3 Regulatory Bodies in the UK

The water and wastewater industry is subject to regulation from several bodies. In general, regulatory activity can be classified into one of four areas:

- economic regulation;
- drinking water quality regulation;
- environmental protection and environmental regulation; and
- customer protection (an indirect influence).

This structure is common throughout the UK, although different statutory bodies exist for these purposes in different nations, as shown in Table 10.1.

The regulatory framework is discussed in further detail in Section 3 below.

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**Table 10.1 Water industry regulators in the UK according to their function**

<table>
<thead>
<tr>
<th>Function</th>
<th>England and Wales</th>
<th>Northern Ireland</th>
<th>Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic regulator</td>
<td>Water Services Regulation Authority (Ofwat)</td>
<td>Northern Ireland Authority for Utility Regulation (NIAUR)</td>
<td>Water Industry Commission for Scotland (WICS)</td>
</tr>
<tr>
<td>Water quality regulator</td>
<td>Drinking Water Inspectorate (DWI)</td>
<td>Drinking Water Inspectorate (DWI)</td>
<td>Drinking Water Quality Regulator (DWQR)</td>
</tr>
<tr>
<td>Environmental regulator</td>
<td>Environmental Agency, Natural England</td>
<td>Northern Ireland Environmental Agency</td>
<td>Scottish Environment Protection Agency (SEPA)</td>
</tr>
<tr>
<td>Consumer body</td>
<td>CCWater</td>
<td>Consumer Council</td>
<td>Waterwatch Scotland</td>
</tr>
</tbody>
</table>
3. PUBLIC POLICY FRAMEWORK FOR REGULATION OF THE WATER AND WASTEWATER INDUSTRY

3.1 Introduction

The economics of the industry are influenced strongly by its legal and regulatory framework. As an EU Member State, the UK is subject to three tiers of legislation: EU directives, national legislation, and local legislation.

3.2 European Context: The Water Framework Directive

A large number of pieces of Europe-wide environmental legislation are relevant to the water industry. Regarding the economics of the industry, the central piece of European Union legislation is the Water Framework Directive, adopted in 2000 (Directive 2000/60/EC). This is one of the larger pieces of European legislation, and has spawned a number of ‘daughter Directives’ (i.e. further pieces of Europe-wide regulation necessary to achieve the aims set out in the Water Framework Directive) and three amendments in 2001, 2008 and 2009. The purposes of the Water Framework Directive are stated as follows (Directive 2000/60/EC, Article 1):

- to protect and enhance aquatic ecosystems;
- to promote sustainable water use based on a long-term protection of available water resources;
- to reduce harmful discharges into the aquatic environment;
- to reduce pollution of groundwater and prevent its further pollution; and
- to contribute to mitigating the effects of floods and droughts.

The Directive aims to contribute to:

- the provision of a sufficient supply of good quality surface water and groundwater for sustainable, balanced and equitable water use;
- a significant reduction in pollution of groundwater;
- the protection of territorial and marine waters; and
- achieving the objectives of relevant international agreements.

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20 Directive 2006/118/EC (Section 4) and Directive 2008/105/EC.
The Directive provides for administrative arrangements to be co-ordinated within river basin districts, rather than along national boundaries (Water Framework Directive, Article 2). It sets time limits for Member States to achieve given standards for the quality of surface waters and groundwater, and control of pollutants discharged into the aquatic environment. It also makes specific standards for areas of particular significance (Water Framework Directive, Article 6).

Importantly for economic regulators, the Directive requires Member States to ensure, by 2010, that the costs of supplying water services are recovered from customers (Water Framework Directive, Article 9). This requires that the cost-reflective charges be ‘disaggregated into at least industry, households and agriculture’ (Water Framework Directive, Article 9, paragraph 1). Member States are also required to ensure that water prices provide adequate incentives for the efficient use of water resources.

There are several other EU directives which impact the UK water industry. These include directives on: drinking water, different forms of waste and pollution, environmental liability, groundwater, soil, and bathing water. These have a direct impact on the regulatory process as compliance may require significant capital investment from the water companies (they bear the burden of compliance). As such, these requirements should be taken into account when the economic regulator sets or reviews price controls.

3.3 The Water Framework Directive’s Use of Economic Tools

The Water Framework Directive relies on economic tools in order to manage Europe’s waters (EC, 2005).

First, water users – such as industries, farmers and households – should bear the full costs of the water services they receive. According to the Water Framework Directive, the prices users pay for water should cover the operational and maintenance costs of its supply and treatment, the costs invested in infrastructure and environmental and resource costs. The inclusion of the last category aims at internalising into economic choice the external costs of using a natural resource such as water. Hence, environmental costs include damage to ecosystems, such as pollution that harms fish and wildlife in rivers. The European Commission has highlighted possible methodologies to measure such costs.

The Water Framework Directive also states that water pricing should create incentives for the efficient use of water resources. If users pay the real costs of the water they use, they will certainly waste less of it. This brings economic efficiency and reduces the financial burden on public authorities, while improving the environment.

According to the Commission, reports submitted by many of the Member States in 2005 on the characteristics of their river basins did not provide...
complete economic information, especially in the areas of industrial and agricultural users and the resource and environmental costs of water services. In many Member States, by then households were paying for a large share of the costs incurred in providing them with water. As water pricing policies have to be introduced by 2010, there was still significant work to undertake to comply with the Water Framework Directive.

Second, Member States should use economic analysis in the management of their water resources, in particular to determine what alternative policies are most cost-effective. Member States have a wide choice of measures to achieve the objective set by the Water Framework Directive of high quality of Europe’s water by 2015. They can launch new investment projects, implement new regulations, set up economic instruments, and negotiate agreements with polluters. Some measures can entail costly investments. Economic analysis assessing the cost-effectiveness of alternative measures will be vital in ensuring that funds are well spent.

3.4 Economic Regulation in the UK: Objectives and Legislation

The objectives of economic regulation in the UK are set out in statutory duties applying to each of the economic regulators. These incorporate the requirement in the Water Framework Directive for cost-reflective pricing, by requiring that regulators ensure water companies carry out their functions, and can finance those functions. However, they also set out objectives designed to protect customers’ interests, including ensuring prices do not discriminate between customers.

In England, Wales and Northern Ireland, the duty to protect customers’ interests explicitly incorporates a duty to promote or facilitate competition. The analogous legislation in Scotland does not mention competition explicitly in respect of this duty. However, the Scottish regulator has taken the boldest steps towards introducing competition, as discussed below.

3.4.1 England, Wales and Northern Ireland

Water legislation was consolidated in 1991 with the Water Industry Act 1991, which sets out the duties of the economic regulator. Ofwat – the regulator in England and Wales – bears a primary duty to exercise and perform its powers and duties in a manner that it considers best calculated to:

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22 Ofwat, in England and Wales, is required to ‘promote’ competition, while NIAUR, in Northern Ireland, is required only to ‘facilitate’.

23 This has been amended with the Water Industry Act 1999 and the Water Act 2003.
• protect the interests of current and future consumers, wherever appropriate by promoting effective competition (Water Industry Act, s2(2B));
• secure that the functions of water companies are properly carried out (Water Industry Act, s2(2A)(b));
• secure that water companies are able, in particular by securing reasonable returns on their capital, to finance the proper carrying out of those functions (Water Industry Act, s2(2A)(c)); and
• secure that the activities and statutory functions imposed on water suppliers are properly carried out (Water Industry Act, s2(2A)(d)).

The primary duties of the Northern Ireland regulator, NIAUR, are almost identical to those for Ofwat, with the exception that the fourth primary duty expressed above is not stated (Water and Sewerage Services (NI) Order, s6(2)(a–c)).

Subject to these primary duties, Ofwat (Water Industry Act, s2(3)(a–e)) and NIAUR (Water and Sewerage Services (NI) Order, s6(5)(a–e)) each bear identical secondary duties to:

• promote efficiency on the part of water companies;
• secure that there is no undue preference or discrimination in the fixing of water and drainage charges;
• protect the interests of customers in connection with the proceeds of land disposals by water companies;
• protect the interests of customers in respect of non-regulated activities by ensuring arm’s length transactions and suitable accounting; and
• contribute to the achievement of sustainable development.

Ofwat and NIAUR must have regard to the principles of best regulatory practice when following these primary and secondary duties (including the principles that regulation is transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed).

3.4.2 Scotland
The duties of WICS – the Scottish regulator – are expressed differently from those of Ofwat and NIAUR, but cover similar themes. Scottish legislation gives WICS the general statutory function of promoting the interests of current and future customers (Water Industry (Scotland) Act, s1). When determining price limits, WICS must ensure Scottish Water’s income is sufficient to meet the expenditure required for effective exercise of its functions (Water Industry (Scotland) Act, s29C) at the lowest reasonable overall cost (Water Industry (Scotland) Act, s29G).

Other objectives for WICS are defined through executive action. The legis-
Regulation requires the Scottish Government to enunciate principles of charging for each price review, which WICS must follow (Water Industry (Scotland) Act, s29C(4) and s29D(1)). These principles must make provision for the harmonisation of charges (Water Industry (Scotland) Act, s29D(2)) and have regard to Scottish Water’s duty to contribute to sustainable development (Water Industry (Scotland) Act, s29D(4) and s51(1)). For the most recent price review, covering the period 2010–15, the Scottish Government set out the following charging principles (Scottish Government, 2009):

- charges should be stable (preferably not rising faster than inflation);
- charges should allow Scottish Water to recover its full costs;
- charges should reflect costs;
- where removing cross-subsidies, changes to charges should be phased over time; and
- charges should be averaged across Scotland.

WICS has been undertaking an ongoing process of removing cross-subsidies between customer groups: for example, as directed in the Scottish Government’s principles of charging, it increased charges to households and reduced charges to non-households in the price review for 2006–10 to ensure both groups met the full costs of their respective supplies (WICS, 2005, pp. 360–61).

3.5 Interaction with Non-economic Regulation

Economic regulators seek to discharge their duties in the context of other policy objectives relevant to the water industry, including those set out in the Water Framework Directive. The Directive itself recognises this. In relation to the requirement to impose cost-reflective charges by 2010, the Directive states: ‘Member States may in so doing have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected’ (Water Framework Directive, Article 9, paragraph 1).

Economic regulators seek to incorporate these other objectives into the price control process and monitor delivery by water companies of projects designed to meet social, environmental and water quality objectives.

3.5.1 Drinking water quality

In England, Wales and Northern Ireland, the Drinking Water Inspectorate (DWI) monitors water quality and evaluates schemes for all companies to resolve identified problems. Schemes endorsed by the DWI are legally binding on the company, and Ofwat takes them into account in setting prices.
The duties of the DWI were set out in the 1991 Water Industry Act (as amended), although other legislation affects the DWI, principally the Water Supply (Water Quality) (England and Wales) Regulations 2000,\textsuperscript{24} and the Water Act 2003.

The Drinking Water Quality Regulator (DWQR) is the equivalent Scottish regulator. It is governed by Section 7 of the Water Industry (Scotland) Act 2002 and is responsible for ensuring water is safe and pleasant to drink, and that consumer confidence in water quality is maintained. It does this through its powers to obtain information, to inspect and to enforce compliance from Scottish Water if necessary.

3.5.2 Environmental protection

Water undertakers bear a statutory duty to prepare, consult and publish Water Resources Management Plans under the Water Act 2003. These are prepared under guidance from the relevant department of the UK Government (the Department for Environment, Food and Rural Affairs, or Defra) and the Environment Agency (EA), and must be submitted to the relevant UK Government or Welsh Assembly minister, who has the power to direct the companies to change the plans approved by Defra. Once considered by ministers, actions within the Water Resources Management Plans form the basis for companies’ business plans and Ofwat’s price control, and the companies become obligated to deliver these plans (EA, 2008, s1).

3.5.3 Social policy

Water and sewerage services raise issues fundamental to life and health. In 2006, the UK recognised the right to water (DFID, 2006), although more recently (in 2010) it abstained from voting for the United Nations Human Rights Council’s declaration of clean water as a fundamental human right (BBC News, 2010). Social policy requires universal access, at least to a basic level of service. Given that the Water Framework Directive enshrines the principle of cost recovery, a balance must be struck, raising questions over how to treat customers who cannot afford to pay the charge, or who refuse to pay.\textsuperscript{25}

In the UK, water companies have a universal service obligation,\textsuperscript{26} and the

\textsuperscript{24} Full list available on http://www.dwi.gov.uk/stakeholders/legislation/index.htm; the 2010 Water Supply Regulations are currently in preparation.

\textsuperscript{25} This is not a problem in Northern Ireland as the costs of providing water and sewerage services to domestic users are met through taxation.

\textsuperscript{26} A universal service obligation requires the service provider (in this case, a monopoly water company) to provide a service to any customer that requests it.
disconnection of domestic supplies\textsuperscript{27} for non-payment is prohibited (Water Industry Act, s61(1a)).\textsuperscript{28} Pre-payment meters (used in some other utilities) and reduced flow devices are also prohibited (Ofwat, 2010, p. 16). Hence water companies’ options for pursuing unpaid debts are limited compared to suppliers in other industries. In this sense, the service may be considered to have some public good characteristics, because it is partly non-excludable. The inability to disconnect for non-payment appears to have a detrimental impact on overall customer debt (Walker, 2009, p.132).

Water companies have raised the inability to disconnect for non-payment as an issue contributing to a growing problem of failure to collect charges, which was an issue in Ofwat’s most recent price review (Ofwat, 2009b, pp. 103–04). Consumer debt was estimated to have more than doubled over five years (Ofwat, 2010, p. 3).

To a large degree, water and wastewater charges are harmonised geographically within each water company’s region. This means that customers are charged equally according to their water use based on average costs, rather than according to the actual local cost of supply to their premises.

3.5.4 Social tariffs and water poverty

A developing definition of water poverty in the UK (developed by the Chartered Institute of Environmental Health (CIEH) and adopted by CCWater), is when water and sewerage charges are greater than or equal to 3\% of net income (Fitch and Price, 2002, p. 10).\textsuperscript{29}

The link between water poverty and water debt is not fully understood. Despite the absence of penalties for the non-payment of water bills, consumer research carried out on behalf of CCWater (2009, p. 10), suggests that water debtors generally fall into the ‘can’t pay’, rather than the ‘can pay, won’t pay’ category.

Ofwat allows social tariff programmes where they are self-financing, but does not consider social tariffs funded by other customers to be within its power to approve (Ofwat, 2010, p. 9). In contrast to the energy sector, there

\begin{itemize}
\item \textsuperscript{27} That is, supplies to households and domestic supplies to businesses, such as supplies for toilets and kitchens.
\item \textsuperscript{28} See also: Water Services etc. (Scotland) Act (Section 18(6)); and Water and Sewerage Services (NI) Order (Article 100(2)).
\item \textsuperscript{29} The fuel poverty threshold of 10\% was devised on the basis of the 1988 Family Expenditure Survey which found that households in the lowest three income deciles spent on average 10\% of their income on energy. Adopting a similar methodology, and using 1999–2000 data, CIEH found that households in the lowest three income deciles spend on average 3\% of their income on water (Fitch and Price, 2002, pp. 9–10 and Appendix 1).
\end{itemize}
are no regulator-led social schemes in place to reduce the burden of water debt.

The UK Government requires companies in England and Wales to offer households a capped tariff for certain qualifying ‘vulnerable’ customers (‘WaterSure’ scheme) (CCWater, 2007). In addition to this, some of the water companies have set up charitable trusts that aim to help indebted customers pay bills or come to an arrangement regarding repayments.

In 2009, the Walker Review (2009) estimated that transfers between customers of £600 million are built into the rateable value charging system (of which £180 million is transferred from high to low income households) (Walker, 2009, p.16 and see also Chapter 11). The value of these transfers will reduce as increased household metering is adopted. The Walker Review also found that both consumers and water companies consider the government should fund any social benefit arrangements/subsidies.

4. ECONOMIC PRINCIPLES AND METHODS FOR REGULATION OF THE WATER INDUSTRY

4.1 Principles and Elements of Economic Regulation

4.1.1 Introduction

The distribution of drinking water and collection of wastewater is generally understood to be a natural monopoly (see e.g. Cave, 2008, p. 32) because its output can be produced at least cost by a single firm. Natural monopoly theory has historically provided an important rationale for economic regulation of utilities (Geddes, 2000, p. 1165). In the absence of price regulation, water companies would be likely to seek to extract economic rents through higher prices in their monopoly area. As discussed in Section 2, economic regulators regulate the prices that the water industry can charge. This is seen as a necessary substitute for competition for natural monopoly industries.

Several factors act to inhibit competition in the water industry, including: the natural monopolies of water distribution and wastewater collection systems, the high degree of vertical integration in the industry and the high degree of capital expenditure involved. Competition is further hampered by other characteristics which are unique to the sector; these are the high transportation costs for wholesale water (it is very heavy, relative to its value, in contrast to gas or electricity), and the public health aspects of water quality, which make clear accountability desirable and complicate the process of introducing competitive entry.

In the absence of normal market competition acting as a constraint on pricing, economic regulation of the water industry takes place in the form of price...
controls set by the economic regulators (Ofwat, WICS and NIAUR). The provisions for economic regulation of the companies are set out in their licences.

Although the key objective of each regulatory body is to protect the interests of consumers, it is equally important that the regulated companies are able to generate enough return from their assets to ensure that they can manage their assets appropriately and can finance their activities (requiring a return for both their lenders and shareholders).

The system of price controls is intended to allow water companies sufficient revenue to finance the activities necessary to meet their statutory duties, whilst also incentivising future efficiency improvements. However, the best method to achieve this is a matter of debate and incremental improvements have been introduced at each price review. The downside of this is that the process is becoming increasingly complex. The main principles are described below.

Recently, the UK Competition Commission (CC) summarised Ofwat’s price review process as follows:

Ofwat’s framework for determining prices can be summarized as: (a) a five-year price cap that is (largely) independent of actual operating costs over the period, and so encourages cost savings; (b) a regulatory capital value (RCV) that reflects what the company’s owners have invested in the business, and on which they are permitted to earn a return equal to the cost of capital that Ofwat determines; (c) an asset management assessment (AMA) intended to ensure efficient capital maintenance, and a capital expenditure (capex) incentive scheme (CIS) that is intended to encourage realistic and well-evidenced capex planning; (d) an adjustment to reward companies which provide good quality of service, and penalize those that do not (known as the overall performance adjustment); (e) full periodic reviews every five years, including explicit efficiency challenges to both operating expenditure (opex) and capex; and (f) provision for interim determinations between these periodic reviews. (CC, 2010a, p. 4)\(^3\)

In most respects, the price control processes adopted by WICS and NIAUR are analogous to that of Ofwat, albeit that the cost of capital needs to be determined differently, given that Scottish Water and Northern Ireland Water obtain capital funding from the public purse, rather than raising it on commercial terms from capital markets. The key elements of the price control framework are discussed in the remainder of this section.

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\(^3\) We compare Ofwat’s ‘RPI-X’ approach with rate of return regulation in Section 4.2.
4.1.2 Price controls
Price controls, as set by the economic regulators, are quantified for each water company in the form of an allowed change of prices relative to inflation, known as the K factor or simply K. At the simplest level, prices are allowed to change by inflation plus or minus the K factor.\(^{31}\) For example, if K was set at \(+1\%\), prices could rise by \(1\%\) more than inflation. Conversely, if K was set at \(-1\%\), prices would need to decline by \(1\%\) relative to inflation, but if inflation was above \(1\%\) p.a., this would still result in a price increase in nominal terms. K may be positive, negative, or zero, and may be set at different values for each charging year.\(^{32}\)

The level at which K is set reflects, therefore, a number of factors, including the scale of the company’s capital investment programme, its cost of capital and its operational and overhead costs, together with the scope for the company to improve its efficiency. Ofwat specifies that the price limits it sets need to be sufficient to allow the water companies to:

- finance their functions (and be able to raise sufficient capital to enable this);
- run their businesses day-to-day to meet all service, quality and environmental compliance obligations;
- maintain asset systems for current and future customers;
- ensure a sufficient balance between supply and demand for both services;
- meet drinking water standards;
- meet obligations on environmental improvements decided by Ministers; and
- make other desirable drinking water quality, service and environmental improvements.\(^{33}\)

4.1.3 Elements in determining price controls
In the regulatory process, there is informational asymmetry between the

\(^{31}\) More precisely, the weighted average charge increase (also known as the tariff basket) must not exceed the change in RPI plus the K factor. The weighted average charge increase is the average of the increase in charges to metered customers and the increase in charges to non-metered customers, weighted by the proportion of revenue from each of those groups (CC, 2000a, paragraph 4.4 and Appendix 4.1).

\(^{32}\) Utility price caps are generally known as RPI-X, with X being the expected efficiency gains that will be realised by the utility. The ‘K’ for British water industry regulation includes an efficiency factor, though this may be more than offset by other factors such as an allowance for capital investment.

\(^{33}\) See http://www.ofwat.gov.uk/pricereview/pr09faqs/prs_faq_pr09faq04what-prdo.
utility and the regulated industry, the latter having greater knowledge on its costs than the former. Further, there is some tension between the interests of the firm (to maximise profits) and the interests of the consumer (to pay the lowest price). The regulator’s role is to strike the right balance between these. Therefore, the information provided by the firm must be carefully analysed by the regulator before price controls can be determined.

Figure 10.2 summarises the high-level building blocks used by the economic regulators to calculate the revenue required by the water industry in a price review to ensure that the companies can carry out their statutory functions to a suitable standard. The revenue requirement is converted to prices by dividing by the number of customers.

Regulators estimate capital expenditure and operating expenditure ex ante and set incentives designed to encourage companies to outperform the cost and service targets in their price control ex post. The key elements of the price control process are:

- defining appropriate outputs for companies to provide within the price limits to be set. These include performance targets (e.g. the maximum
number of bursts each year) or specific projects (e.g. an upgrade to a
treatment plant designed to address a water quality problem);
• estimating the efficient level of operating expenditure, which is calcu-
lated as the expenditure in the previous period, adjusted for known
changes, expected input price changes and efficiency improvements
(discussed below);
• estimating the efficient level of capital expenditure, including enhance-
ments to service where required by the outputs, expenditure to maintain
existing assets and taking potential efficiency improvements into
account (discussed below);
• calculating depreciation of non-infrastructure (above ground) assets and
allowing for the ongoing renewal of infrastructure (below ground)
assets;
• calculating the cost of capital of the industry; and
• adjusting revenue allowances to reflect companies’ performance against
regulatory incentives.

For example, in its 2009 review, Ofwat adopted a new approach to regulation
of capital expenditure, called the Capital Expenditure Incentive Scheme (CIS).
Under this system, Ofwat determined a baseline level of expenditure for each
company, which it compared to the company’s forecast, to calculate a five-
year expenditure allowance. Ofwat then set an incentive allowance, which
depends on the amount by which the company’s forecast was greater or less
than Ofwat’s baseline (Ofwat, 2009b, s4.2 and p. 67). Penalties, or rewards,
are calculated at the end of the five-year period, although the RCV for the next
price review will be set using a company’s actual expenditure. This system
was designed to ensure companies submit ‘realistic’ business plans (Ofwat,
2008b, p. 33), arising from concerns that companies were ‘gaming’ the
system, although it appears to have made the process significantly more
complex.

4.1.4 Tariff design
The price control sets a cap on the overall level of charges that each company
can levy (Ofwat, 2007a, p. 10). Further (and in contrast to other regulated util-
ities), each company is required to obtain formal approval for its scheme of
charges each year from its economic regulator, even when those charges are
within the price limits. This approval covers both the prices proposed, and the
other terms and conditions of service imposed by the company (Ofwat, 2007a,
p. 15).

Before approving charges schemes, Ofwat requires companies to maintain
a ‘fair balance’ between charges levied on metered and unmetered customers
in each area. In addition, in the case of companies that provide both water and
sewage services, Ofwat requires the charge for each service to reflect the costs of providing the service (Ofwat, 2007a, pp. 15–16).

In Northern Ireland, NIAUR sets individual K factors for each of the five bundles: unmeasured water supply, unmeasured sewage supply, measured water supply, measured sewage supply and trade effluent (NIAUR, 2010, p. 5). In Scotland, WICS sets separate K factors for charges to households, and wholesale charges to licensed retail suppliers (WICS, 2005, pp. 9, 15–16).34

The need for such approval seems to have resulted in a high degree of homogeneity in the structure of charges offered by companies. Typically, companies structure charges in the categories shown in Table 10.2.

### 4.1.5 Efficiency incentives

Economic regulators seek to provide incentives for the industry to maximise efficiency in operating expenditure and capital expenditure. These provide long-term benefits to the consumer, as efficiency savings can be taken into account when calculating future price caps, hence the savings can be passed

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34 The role of licensed retail suppliers, and the competitive regime in which they operate, is discussed in Section 6.2.
Broadly, the regulator sets efficiency incentives by reducing the level of operating and capital expenditure it assumes the company will incur, when it sets price limits. It sets both of the following efficiency incentives:

- relative efficiency, estimated by benchmarking companies against each other and setting an incentive for less efficient companies to catch up to the benchmark; and
- continuing efficiency, where the regulator assumes that the industry benchmark itself will become more efficient over time (Ofwat, 2009b, p.106).

4.2 Methods of Economic Regulation: The Price Review Cycle in the UK

4.2.1 Timescales

As with all regulated utilities, there is a tradeoff between the frequency at which price controls are reset, and the incentive properties. If price controls are set too frequently, the utilities will have little incentive to increase their efficiency, since any profit from such efficiency gains will soon be regulated away under a lower price cap. This scenario closely mimics the properties of rate of return regulation.35 Conversely, although increasing the duration of a price control will provide stronger incentive properties, the longer the period between price control reviews, the greater the risk of adverse consequences from the price control being set at the wrong level. If the price control turns out, with hindsight, to have been too lax, there is a danger that companies will be allowed to retain excessive monopoly profits for extended periods. Alternatively, if the price control is set too tightly, there is a danger that a company will be unable to finance its regulated business, even if it is fully efficient.36

The first price control was set for ten years in England and Wales, although it was reviewed at the halfway point. Scottish Water’s initial price control was for four years. The first price control in Northern Ireland was for three years (NIAUR, 2010, p. 5). Currently, prices are set every five years in England, 

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35 Rate of return regulation is used primarily in the US. It determines the return to investment enjoyed by the utility as the return on its regulatory asset base required to attract ‘new and useful’ investment. Under this regulatory regime, the utility has no incentive to increase efficiency, since efficiency gains do not impact upon its return to investment. See Braeutigam and Panzer (1993).

36 A discussion on the appropriate timescale for regulatory review cycle can be found at Ofgem (2010, pp. 30–32).
Wales and Scotland, and the length of subsequent price controls for Northern Ireland Water has not yet been decided. In all cases, it is possible to vary price limits between price reviews if circumstances change significantly via the issue of an interim determination (see further below).

4.2.2 Monitoring
Companies submit regulatory accounts every year (in addition to their statutory financial statements) according to guidance specified by the regulator. This is the main source of data for the regulator in setting prices, as well as in monitoring performance against the price control.

Economic regulators monitor companies’ performance each year against the outputs they are required to deliver. This is designed to ensure companies deliver the required quantity and quality of output within the price limits set. Otherwise, if regulation applied only to prices, the companies would have an incentive to extract monopoly rents by reducing the service they deliver. Regulators monitor:

- progress against the capital programme set out in the price control (which usually encompasses outputs such as meeting customer demand, improving water quality or environmental outcomes, or improving quality of service to customers);
- customer service (such as call handling and frequency of interruptions to supply);
- performance against operating cost targets; and
- performance against environmental and water quality obligations.

4.2.3 Incentives and penalties
Companies have incentives to meet (or exceed) their performance targets. Companies that have not delivered their outputs in a given price control period face financial penalties through the price limits set in the following control. In other words, a poorly performing company is allowed less revenue in the following price control period to meet its obligations, resulting in lower profits and lower dividends for shareholders than would otherwise be the case. Conversely, companies that perform well will be allowed an uplift to revenues in the next price control period, presumably resulting in greater profits and higher dividends for shareholders.

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37 Price reviews in Scotland were quadrennial until the 2009 review, which runs for five years from 2010 to 2015 (WICS, 2009e, p. 5).
38 See, for example, Ofwat (2009b).
39 The most recent regulators’ performance reports are: Ofwat (2009d); Ofwat, (2009a); WICS (2009b); WICS (2009c); WICS (2009a); NIAUR (2009).
A rolling incentive mechanism allows companies to retain the benefits of any outperformance of their expenditure targets (i.e. where they spend less than assumed in the price control) (Ofwat, 2007b). Ofwat also monitors companies’ performance against customer service and environmental impact targets using the Overall Performance Assessment (OPA) (Ofwat, 2009d). Prices in each price review are increased by up to 0.5%, or reduced by up to 1.0%, depending on companies’ OPA score in the previous period (Ofwat, 2009b). WICS (2009b) and NIAUR (2009) both set targets for OPA scores to be achieved by Scottish Water and Northern Ireland Water respectively.

4.2.4 Interim determinations
Between price reviews, price limits may be varied through an interim determination if circumstances change significantly, and/or certain predefined criteria are met. The licences of the English and Welsh companies make provision for an interim determination of K (IDoK) in the following circumstances:

- on the occurrence of specific events which the regulator has stated explicitly that the price control has not allowed for (‘Notified Items’);
- where there is a ‘relevant change of circumstance’, such as changes in legal obligations or the company’s failure to deliver an output included in price limits; or
- where substantial adverse effects have occurred, which could not have been avoided by prudent management action, or substantial favourable effects have occurred which are not attributable to prudent management action.

In each case, a materiality threshold applies. In the case of a notified item or relevant change of circumstance, the company’s costs or revenue must have changed by at least 10% of one year’s turnover.\textsuperscript{40} To trigger an IDoK in circumstances on the grounds of substantial adverse effects, the materiality threshold is 20% (CC, 2009, paragraphs 2.20–2.30). If the materiality threshold is satisfied, the regulator must allow prices to be adjusted according to a method set out in the licence. Where circumstances change, leading to a company’s outputs changing by less than the materiality threshold, this change in outputs is allowed for in the next price review.

\textsuperscript{40} The net present value of the change in operating costs or revenue over 15 years is compared to the materiality threshold. For a change in capital costs, the net present value of the change in costs for the remainder of the five-year price review process is used.
4.2.5 Appeals

After the final determinations are published, companies must choose whether to accept or dispute its determination. If a company accepts the price limits, it must try and deliver its outputs in line with those limits. If not, the regulator’s decision is reviewed by the Competition Commission (previously the Monopolies and Mergers Commission). The Competition Commission must make a full redetermination, which is substituted for that of the economic regulator. A similar mechanism applies for IDoKs.

Table 10.3 summarises the outcome of appeals by companies against Ofwat’s full price control decisions (excluding IDoKs).

<table>
<thead>
<tr>
<th>Company and price control</th>
<th>Average K factor: Ofwat</th>
<th>Average K factor: Competition Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.6) 2000–2005</td>
<td>(0.0) 2000–2005</td>
</tr>
<tr>
<td></td>
<td>0.0 2000–2005</td>
<td>0.0 2000–2005</td>
</tr>
</tbody>
</table>

Sources: Ofwat, 1994, p. 5; CC, 1995a, p. 31; CC, 1995b, p. 41; CC, 2000a, p. 12; CC, 2000b, p. 12; Ofwat, 2009b, p. 21; CC, 2010a, p. 8. Average K factors are calculated as compounded average annual growth rates.

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41 The Competition Commission is an independent public body which conducts in-depth inquiries into mergers and markets with the objective of ensuring healthy competition between companies in the UK for the benefit of companies, customers and the economy. Its use as an appellate body in this circumstance is a legacy function inherited from the Monopoly and Mergers Commission.

42 A significant implication of this is that a company cannot limit its appeal to particular items within the regulator’s determination. The Competition Commission redetermines all aspects of the price control for the appellant company, which may result in the company’s position deteriorating on some (or all) elements.
5. PRACTICAL EXPERIENCE OF ECONOMIC REGULATION WITHIN THE UK WATER INDUSTRY

5.1 Introduction

The economic regulatory framework continues to evolve, partly as a result of lessons learned, and partly as a response to new issues (such as climate change) as they emerge. This section summarises the practical experience of the economic regulation of the water and sewerage industry in the UK since the privatisation of the ten major water and sewerage undertakers in 1989.

5.2 Privatisation of the Water and Sewerage Companies

The Water Act 1973 created ten Regional Water Authorities in England and Wales, accountable to the central government (Ofwat and Defra, 2006, p. 2). In addition to supplying 75% of drinking water and 100% of sewerage services in England and Wales, these statutory authorities were also responsible for environmental control, water resource planning, fisheries, land drainage, flood protection and navigation.\(^{43}\)

The government unveiled proposals for privatisation of the ten Regional Water Authorities in 1984. These were badly received by the public. Due to the unpopularity of these plans, implementation was delayed until after the 1987 general election (Lobina and Hall, 2001, p. 5).

The Water Act 1989 transferred the water supply and sewerage service functions from each of the Regional Water Authorities to ten newly created water and sewerage companies (WaSCs) (Ofcom and Defra, 2006, p. 3). It also created a set of new regulators, overseeing not only the water and sewerage companies (WaSCs), but also the water only companies (WoCs). These included the Drinking Water Inspectorate (DWI), responsible for monitoring water quality, the National Rivers Authority (NRA), responsible for monitoring river and environmental pollution; and, most importantly, the Director General of Water Services (DGWS) (also known as Ofwat), responsible for economic regulation of the water and sewerage industry in England and Wales (National Audit Office, 1992, paragraphs 1.4–1.5).\(^{44}\) Water supply and sewerage services in Scotland and Northern Ireland remained as government functions.

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\(^{43}\) The remaining 25% being supplied by 29 privately owned water companies; see National Audit Office (1992, paragraph 1.2).

\(^{44}\) The NRA was replaced by the Environment Agency (see Lobina and Hall, 2001, p. 5) and in April 2006, Director General of Water Service’s functions transferred to the Water Services Regulation Authority (‘Ofwat’, see http://www.ofwat.gov.uk/).
5.2.1 Sale circumstances and share price movements
The simultaneous sale of the ten WaSCs was more complex than the earlier privatisations. They were floated on the stock market on 12 December 1989 (National Audit Office, 1992, paragraph 4.4) and the initial flotation price was £2.40 per share for all ten companies (paragraph 4.1). The National Audit Office indicated that this valuation was based on ‘the expected stream of future dividends’ (National Audit Office, 1992, paragraph 3.18). The sale raised gross equity proceeds of £5.2 billion (National Audit Office, 1992, Appendix 5).

5.2.2 Increase in investment since privatisation
It appears that there have been substantial increases in capital investment in the water sector following privatisation. Ofwat stated, for example, that ‘Since privatisation, the sectors have invested about £85 billion in water and sewerage infrastructure in England and Wales. This equals average annual capital investment of more than £4.2 billion, compared with an equivalent investment figure of about £2 billion a year during the 1980s’ (Ofwat, 2009a, p. 27).

5.3 Summary of Price Controls since Privatisation
Table 10.4 summarises the K factors imposed in price controls in England and Wales since 1989.
These price controls are discussed in more detail in Sections 5.4 to 5.8 below.

Table 10.4 K factors (average annual increase in prices, above inflation) since 1989, England and Wales

<table>
<thead>
<tr>
<th>Price review</th>
<th>Period</th>
<th>Average annual K factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR99</td>
<td>2000–05</td>
<td>(2.1%): supersedes PR94</td>
</tr>
<tr>
<td>PR04</td>
<td>2005–10</td>
<td>4.2%</td>
</tr>
<tr>
<td>PR09</td>
<td>2010–15</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

Table 10.5 summarises the K factors imposed by price controls in Scotland since the first price control in 2002.

The first price control in Northern Ireland set an average K factor of minus 0.7% for the period 2010 to 2013 (that is, charge caps increase by 0.7% below inflation on average from 2009–10 to 2012–13: NIAUR, 2010, p. 5).

5.4 The First Five Years: 1989 to 1994

5.4.1 Price controls at privatisation

Notwithstanding that for each privatised utility there was an economic regulator with specific duties to control prices, in each case the initial price levels and price limits were set by the government immediately prior to privatisation (National Audit Office, 1992, paragraph 2.4). The initial price limits provided for prices to increase by 5% p.a. above inflation from 1989 to 1994 (Ofwat, 1993, p. 14), and 3.7% p.a. from 1994 to 1999 (Ofwat, 1994, p. 6).

5.4.2 Tariffs and tariff design

The privatisation of the water industry in 1989 was a trigger for a certain amount of tariff innovation. This covered the whole spectrum of tariffs from the largest to the smallest customers.

Part of this was as a result of pressure from the largest customers, able to bring commercial pressure to bear (for example, by threatening to develop their own water supply and/or operate their own waste treatment plant). This

<table>
<thead>
<tr>
<th>Price review</th>
<th>Period</th>
<th>Average annual K factor</th>
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<tbody>
<tr>
<td>SRC 2002–06</td>
<td>2002–06</td>
<td>2.0%* **</td>
</tr>
<tr>
<td>SRC 2006–10</td>
<td>2006–10</td>
<td>(0.5%) household</td>
</tr>
<tr>
<td>SRC 2010–15</td>
<td>2010–15</td>
<td>(1.5%) non-household</td>
</tr>
</tbody>
</table>

Notes:
* SRC 2002–06 is a revenue cap rather than a price cap.
** Price limits for SRC 2002–06 and SRC 2010–15 are expressed as total growth over the period, rather than an annual average. We show the equivalent compounded average annual growth rate.

Sources: WICS, 2001, p. 2; WICS, 2005, p. 2; WICS, 2009e, p. 9.

Table 10.5 summarises the K factors imposed by price controls in Scotland since the first price control in 2002.

The first price control in Northern Ireland set an average K factor of minus 0.7% for the period 2010 to 2013 (that is, charge caps increase by 0.7% below inflation on average from 2009–10 to 2012–13: NIAUR, 2010, p. 5).
led to companies launching Large User Tariffs, which offered customer bulk discounts, often with limited economic justification.

There was pressure, too, from both the regulatory framework and from customer advocates, to ensure that social tariffs were implemented for poorer household customers that might otherwise have difficulty affording to pay their water bills.

5.4.3 Profitability following privatisation

The privatised water companies performed better than expected following privatisation. Table 10.6 compares the actual operating profit of selected water companies with their expected performance. Both North West Water\(^45\) and South West Water exceeded their expected operating profits by a large margin after 1990. Thames Water’s operating profit also exceeded expectations, but by less and only from 1992.

Table 10.7 compares the actual dividends of selected water companies with their expected performance. Again, both North West Water and South West Water exceeded expectations, although Thames Water did not.

The industry’s outperformance of its expectations led to concerns that the company valuations at privatisation had been too low, or regulation had been too lax, or both. These concerns were shared across privatised, regulated

<table>
<thead>
<tr>
<th>Table 10.6 Actual vs. expected operating profit of selected WaSCs</th>
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<tr>
<td>North West Water</td>
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<td>South West Water</td>
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<tr>
<td>Thames Water</td>
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</tbody>
</table>

*Sources:* Charterhouse Tilney (1989); South West Water plc accounts, 1990 to 1995 (year end 31 March), Thames Water plc accounts, 1990 to 1995 (year end 31 March) and North West Water plc accounts, 1990 to 1995.

\(^{45}\) North West Water is now part of United Utilities.
utilities. These concerns led to a windfall tax in 1997 (Brown, 1997, paragraphs 188–97). The tax was 23% of the difference between the actual value of the companies and their valuation at privatisation (Chennells, 1997, pp. 279–91). It aimed to raise £5.2 billion, of which just under one-third (£1.7 billion) was from the water industry (Chennells, 1997, pp. 279–91). A windfall tax can be expected to be economically efficient if it only affects past profits and is a one-off, thereby leaving expectations of future returns unchanged. However, if there is suspicion that the tax might be imposed again, it will increase uncertainty for investors (thereby increasing the cost of capital: see Chennells, 1997, pp. 288–9) and reduce incentives to increase profits by improving efficiency.

This outperformance also led to a tightening of price limits, as described below.

5.5 The 1994 Periodic Review

When the water companies were privatised, the government had set prices for an initial ten-year period. Increasing household water bills caused the regulator to call for an early review of prices in 1994. This Periodic Review (PR94) was to reset price limits for the next ten years from 1 April 1995.

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46 The ‘actual value’ was calculated as the average of each company’s post-tax profits over the first four full years after privatisation, multiplied by an assumed price-earnings ratio of nine.

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Table 10.7 Actual vs. expected net dividend of selected WaSCs

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<tbody>
<tr>
<td>North West Water</td>
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</tr>
<tr>
<td>Actual</td>
<td>37</td>
<td>64</td>
<td>70</td>
<td>77</td>
<td>86</td>
</tr>
<tr>
<td>Expected</td>
<td>30</td>
<td>61</td>
<td>58</td>
<td>53</td>
<td>52</td>
</tr>
<tr>
<td>South West Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td>14</td>
<td>24</td>
<td>27</td>
<td>30</td>
<td>32</td>
</tr>
<tr>
<td>Expected</td>
<td>16</td>
<td>22</td>
<td>22</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Thames Water</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td>39</td>
<td>67</td>
<td>74</td>
<td>82</td>
<td>89</td>
</tr>
<tr>
<td>Expected</td>
<td>65</td>
<td>79</td>
<td>77</td>
<td>86</td>
<td>91</td>
</tr>
</tbody>
</table>

Sources: Charterhouse Tilney (1989); South West Water plc accounts, 1990 to 1995 (year end 31 March), Thames Water plc accounts, 1990 to 1995 (year end 31 March) and North West Water plc accounts, 1990 to 1995.
There were three main reasons for the review (Ofwat and Defra, 2006, p. 57):

- major changes in quality obligations imposed on water and sewerage companies;
- updates to financial parameters. Ofwat believed that the initial parameters used to calculate K factors were overly generous for the financing of an efficient company (as reflected in the outperformance described above); and
- no efficiency targets had been built into price limits after 1994 at privatisation.

The results of the review were as follows:

- average annual price limits were lowered from 3.7% to 1.4% p.a. for the periods 1995–6 to 1999–2000 (Ofwat, 1994, p. 6);
- changes to expected price increases, due to costs of compliance with the EC Urban Wastewater Treatment Directive (EC Directive 91/271/EEC). Generally, sewerage charges were expected to increase at a faster rate than water charges (Ofwat, 1994, p. 12); and
- South West Water and Portsmouth Water appealed their price limits to the Monopolies and Mergers Commission. The results of these appeals on the K factors set by Ofwat were minimal (Ofwat and Defra, 2006, p. 68).

5.6 The 1999 Periodic Review

In 1996, Ofwat announced another periodic review to take place in 1999 (PR99) for all water and sewerage companies. The aim of the review was for companies to demonstrate their efficiency gains and improved service standards, such that it could be demonstrated that real prices had reduced. The stated objectives of the review were to (Byatt, 1997):

- transfer efficiency gains to customers and create scope for further efficiency gains within price limits;
- create a framework for allowing costs of increasing quality obligations to be met without real prices increasing; and
- develop a framework such that expenditure to balance supply and demand could be met by charging customers whose demand has increased.

The regulator took several steps to align the price review with other utilities. First, it shortened the period of the review to five years, and second, it
made an initial downward adjustment in prices for 2000–01 due to outperformance in the prior period (Ofwat, 1999, p. 9). Prices were heavily reduced for 2000–01, by an average of 12.3%, with prices remaining largely flat thereafter (Ofwat, 1999, p. 9). The results of the review were not received well by the market. PR99 ‘was seen to have precipitated a flight of equity and led companies to trade at a discount to their regulatory asset base (RAB). It was also seen to have acted as a catalyst for a series of structural changes in the sector – with the emergence of highly-gearied companies with structured debt finance’ (Smith, 2007, pp. 195–6).

Mid Kent Water and Sutton and East Surrey Water appealed to the Competition Commission regarding their price limits. The Competition Commission held different views in certain respects compared with both the Director and the claimant companies; however, its final determinations were closer to those set by Ofwat than those estimated by the companies. However, both claimants saw some benefit in the Competition Commission’s judgement. The figures can be seen in Tables 10.8 and 10.9.

### Table 10.8 Outcome of Mid Kent Water’s appeal against PR99 Final Determination

<table>
<thead>
<tr>
<th>K factors</th>
<th>2000/01</th>
<th>2001/02</th>
<th>2002/03</th>
<th>2003/04</th>
<th>2004/05</th>
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<td>+3.7</td>
<td>+3.7</td>
<td>+3.7</td>
</tr>
<tr>
<td>Ofwat determination</td>
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<td>0.0</td>
<td>0.0</td>
<td>+1.6</td>
</tr>
<tr>
<td>Competition Commission</td>
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<td>+4.5</td>
<td>+3.2</td>
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<td>0.0</td>
</tr>
<tr>
<td>determination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: CC (2000b, p. 12).*

### Table 10.9 Outcome of Sutton and East Surrey Water’s appeal against PR99 Final Determination

<table>
<thead>
<tr>
<th>K factors</th>
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<th>2001/02</th>
<th>2002/03</th>
<th>2003/04</th>
<th>2004/05</th>
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</tr>
<tr>
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<td>−2.4</td>
<td>0.0</td>
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</tr>
<tr>
<td>Competition Commission</td>
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<td>+2.1</td>
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</tr>
<tr>
<td>determination</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Source: CC (2000a, p. 12).*
5.7 The 2004 Periodic Review

The subsequent Periodic Review (PR04) built upon the approach developed with PR99. The stated aims were to set price limits providing the best value to customers, allow well-managed companies to deliver the correct levels of service, and to incentivise improved efficiency and service levels.

The business plans were taken as a starting point for the determinations. Price limits were set according to certain assumptions about each company’s performance in certain key areas, including (1) the scale of future efficiency gains, (2) expenditure on enhancements to security of supply or to enhance service levels, (3) the ability of the company to finance its activities and retain a strong financial position.

PR04 was different from its peers in that no prior assumptions on price limits would be made by the regulator. In addition, Ofwat published its financial model and the key assumptions given to each company.

The results of the review were as follows:

- price limits were increased by an average of 4.2% (pre-inflation) for the period. Increased prices were seen as necessary to sustain levels of service quality and performance. Substantial capital investment was required to maintain assets, implement tighter standards at sewage treatment works, and help protect homes against the risk of sewer flooding (Ofwat, 2004, p. 10);
- the increase in price limits for the period was front-loaded. An average increase in bills of 8.5% in April 2005 reflected companies’ current costs (Ofwat, 2004, p. 17);
- price limits were set based on assumed operating cost-efficiency improvements of 1.4% (water) and 1.3% (sewerage) p.a. (Ofwat, 2004, p. 10);
- improvements in efficiency were incentivised by allowing companies to retain efficiencies in excess of regulatory targets for five years;\(^{47}\) and
- the post-tax cost of capital was estimated at 5.1% (Ofwat, 2004, p. 10).

The K factors determined were approximately one-third lower than those specified in the companies’ business plans (an average of 6.2%) (Ofwat, 2004, p. 11); however, there were no appeals against the final determination (Ofwat and Defra, 2006, p. 68). In September 2008, Sutton and East Surrey Water

\(^{47}\) The regulatory approach was described as the ‘carrot and stick model’; the outperformance incentive being the carrot, while the efficiency improvement factors built into the final determinations provided the stick. See Ofwat (2004, pp. 28–32).
applied for an interim increase in K due to increased power costs and lower than forecast consumption (CC, 2009, p. 3). This was rejected by Ofwat, then by the Competition Commission after the company’s appeal.

An independent report regarding PR04 was commissioned by Ofwat to evaluate its price review process and the views of stakeholders. This was published in August 2005 and found that stakeholders were generally satisfied with the process and that ‘the 2004 review represented a major improvement on what had gone before’ (Baker et al., 2005, p. 4). Several recommendations were also made for subsequent periodic reviews, these falling broadly between the two themes of (1) increased clarity of ‘roles, powers and the rules of the game’ and (2) ‘Long term planning and the periodic review cycle’ (Baker et al., 2005, p. 5).

5.8 The 2009 Periodic Review

As a result of the feedback on PR04, a longer-term focus on the water companies and their industry was included in PR09. Companies were required to prepare Strategic Direction Statements in 2007, which described their goals over the next 25 years.

Consultation with stakeholders on the framework and approach of the periodic review was undertaken from October 2007, with the final framework for the review published in March 2008.

A new approach to regulation of capital expenditure was also adopted, called the Capital Expenditure Incentive Scheme (CIS). Under this system, Ofwat determined a baseline level of expenditure for each company, which it compared to the company’s forecast to calculate a five-year expenditure allowance. The company’s incentive allowance depends on the amount by which its forecast was greater or less than Ofwat’s baseline (Ofwat, 2009b, s4.2 and p. 67). Penalties, or rewards, are calculated at the end of the five-year period, although the RCV for the next price review will be set using a company’s actual expenditure.

The results of the PR09 review were as follows:

- price limits to increase by an average of 0.5% p.a. before inflation, but with a real reduction in average household bills of £3 over the period (this is because customers moving from unmetered to metered supply were switching to lower bills) (Ofwat, 2009b, p. 7). The price limits were on average 2% p.a. lower than those proposed by the companies (Ofwat, 2009b, p. 11);
- a high level (£22 billion) of capital expenditure expected, including ‘nearly all the statutory proposals to improve the environment and water quality’ (Ofwat, 2009b, p. 7);
• Notified Items for bad debt, highways agency charges and water abstraction charges (Ofwat, 2009b, pp. 104–06); and
• a real post-tax cost of capital at 4.5%, including a cost of equity of 7.1% (Ofwat, 2009b, p. 128).

5.8.1 Appeals
One company, Bristol Water, appealed Ofwat’s decision to the Competition Commission. The outcome was that the Competition Commission allowed a higher price increase for Bristol Water than that set by Ofwat (CC, 2010b).

6. EMERGING ISSUES

6.1 Introduction
This section is intended to highlight some of the emerging issues that the authors anticipate will lead to further changes in both the economics of the water industry, and the way it is regulated. These include the introduction of further water trading and end-user competition in the water sector, the possibility of a ‘national grid for water’ being developed, and the advent of smart metering.

6.2 Water Trading and Further Competition
End-user competition is less advanced in the water industry than in other regulated utility industries, such as the gas and electricity industries. While customers have always had some degree of choice of alternatives to the public supply (e.g. via their own private supplies, or through conserving or recycling water), the industry remains largely dominated by the regional monopolies (Cave, 2009, p. 6). Competition appears to have advanced the furthest in Scotland, where a competitive market for retail services to non-household customers opened in 2008. In England and Wales, Ofwat has recognised the challenge of promoting further competition, which has also received impetus from a government review.

6.2.1 England and Wales
The main methods for competitive entry into the water industry in England and Wales currently can be summarised as follows:

• water supply licence (retail) – where a new entrant purchases water from the incumbent water undertaker and supplies water to an eligible customer. Eligibility is restricted to non-household customers using 50 megalitres (ML) of water p.a.;
• water supply licence (combined) – where a new entrant introduces its own water to an incumbent water company’s network for onward sale to the new entrant’s own customers (referred to as ‘common carriage’). All water companies maintain access codes which set out the conditions under which licensees may introduce water into their networks;
• inset appointments – which allow one company to replace another as the statutory undertaker for water or wastewater in a specified geographical area within the water company’s appointed territory;
• cross-border supplies – where a customer in an area adjacent to a neighbouring water company’s territory can connect to another water company’s network and receive a supply;
• self-lay – where developers, or their contractors, provide new water mains and service pipes instead of asking water companies to do the work. The Water Act 2003 introduced a statutory framework for self-lay;
• private supplies – where a customer uses its own source rather than the public supply system. This can also include on-site water treatment.

There is general acceptance that these facilities have been insufficient to establish meaningful competition. Only 30 inset appointments have been granted, and the first customer to switch supplier under the water supply licensing regime did so only in August 2009 (Severn Trent Services, 2009). Problems include:

• lack of transparent and standard processes for new suppliers to enter the market, and for customers to switch (Cave, 2008, p. 53);
• lack of standard access pricing. In particular, access pricing under the water supply licensing regime is governed by a ‘costs principle’ that has given little scope for new entrants to compete with incumbents, because the access price tends to be assessed as being the end-user tariff less the short-run marginal costs, which are small (Cave, 2008, p. 50);
• the competitive arrangements are limited to large customers (those using above 50 Ml p.a., which includes only 2,200 (Ofwat, 2007d, p. 23) of the 1.25 million (Ofwat, 2007c, p. 16) non-household customers in England and Wales); and
• barriers to new entrants to access abstraction licences to develop their own alternative supplies (Cave, 2009, p. 46).

48 See, for example, Yarrow et al. (2008, chapter 5).
49 Ofwat, Register of new appointments and variations granted to date, downloaded from Ofwat website (www.ofwat.gov.uk/competition/inset/) in October 2010.
50 See also, Ofwat (2007, p. 10). Difficulties in construction of the costs principle were addressed by the Competition Appeal Tribunal in CAT 23.
Cross-border supplies are also restricted by a lack of incentives, complexity and lack of transparency. For example, a company purchasing water from a neighbour increases operating costs, which impacts negatively on Ofwat’s assessment of a company’s operating efficiency, whereas the company can earn a return on the capital it invests in developing its own source (Cave, 2009, p. 46).51

The state of competition in the industry has led to several official investigations. In 2007 and 2009, Ofwat published papers proposing changes to the existing regulatory regime, along with a series of longer-term proposals to develop competition in the industry.52 In 2008, the UK Government commissioned an independent review of competition and innovation in water markets. The review (Cave, 2009), led by Professor Martin Cave, reported in March 2009 (the ‘Cave Report’).

Proposals for future development of competition include:

• Vertical separation – e.g. separation of an incumbent’s retail services arm from its treatment and distribution functions. Ofwat has stated that vertical separation will promote competition because it ‘will aid transparency, improve cost reflectivity [i.e. ensure that the prices charged for services reflect the economic cost of delivering those services], identify competitive opportunity and make entry to the market simpler’ (Ofwat, 2008b, p. 5). Ofwat is revising its regulatory accounting guidance to require companies to report costs separately for nine business units.53 In the next price control review, covering the period 2015–2020, Ofwat intends to set vertically separated price controls (Ofwat, 2009e, p. 3);

• Retail competition – Ofwat and the Cave Report (Cave, 2009, pp. 84–5) both recommended the introduction of retail competition for non-household customers, including key elements of Scotland’s competitive regime (see below), with the eligibility threshold to be reduced (but not necessarily abolished);

• Access prices – both Ofwat (Ofwat, 2009f, p. 11) and Professor Cave (Cave, 2009, p. 72) recommend reform of the costs principle. The Cave Report recommended replacing the costs principle with an ex-ante access pricing framework based on long-run avoidable costs, with

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51 See also, Severn Trent Services (2010, p. 41).
52 See, for example, Ofwat (2007d); Ofwat (2007c); Ofwat (2008b).
53 The business units are water resources, raw water distribution, water treatment, treated water distribution, retail, sewage collection, sewage treatment, sludge treatment and sludge disposal.
uniform access prices determined by Ofwat for each water resource zone (Cave, 2009, p. 72). Ofwat recommended that it be given responsibility for specifying how access prices should be set, based on general criteria set out in legislation (Ofwat, 2007c, p. 13):

- **Abstraction rights trading** – Ofwat recommended the potential introduction of changes to the regime, including abstraction rights trading (Ofwat, 2008a, p. 80). Internationally, abstraction rights trading has tended to develop in countries with high levels of water scarcity and well-developed property rights, where trading allows scarce water to be allocated based on market values.\(^{54}\) In the UK, some commentators see abstraction rights trading as a precondition for upstream competition, because it would send economic signals of where water was most valuable (Yarrow et al., 2008, p. 58); and

- **Inset appointments** – Ofwat recommends that, in principle, inset appointees should be treated in the same manner as other appointed water companies, in relation to all its recommendations. Ofwat will consider the detailed implications for inset appointees under each of its proposals.

The Labour Government responded positively to the Cave Report in 2009 (HM Treasury, 2009, p. 78), but following the election of a Coalition Government in May 2010, the status of the reforms discussed above is not clear. At the time of writing, the government is due to publish a Water White Paper in the summer of 2011 (Defra, 2010).

### 6.2.2 Scotland

Competition in the water industry has progressed further in Scotland than in the rest of the UK. A competitive market for retail water and sewerage services to non-household customers opened in Scotland on 1 April 2008 (WICS, 2008). Under legislation of the Scottish Parliament (Water Services etc. (Scotland) Act, part 2), Scottish Water’s customer-facing services were separated from the rest of the business, in a new company known as Business Stream. Non-household customers can choose between Business Stream and several other retail providers, licensed by WICS (known as ‘licensed providers’). The remaining part of Scottish Water provides wholesale services (i.e. all services shown in Figure 10.1, other than retail services), to all the licensed providers at a regulated, non-discriminatory price and service level.\(^{55}\)

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\(^{54}\) Water trading regimes are active in the western United States, Chile and Australia. For an overview of Australian water markets, see National Water Commission (2009).

\(^{55}\) Wholesale prices are set out in Scottish Water’s wholesale charges scheme,
Licensed providers sell these services to customers, and provide customer-facing retail services, including billing, meter reading and handling connections to the network.

The Scottish arrangements aim to address the barriers to entry and effective competition that have been experienced in England and Wales. In particular:

- entry of new providers and customer switching takes place through published processes, regulated by WICS and (in the case of customer switching), a Central Market Agency (CMA) established by the industry;56
- Scottish Water charges a uniform wholesale price, which is regulated by WICS, thereby avoiding complex pricing negotiations, or any potential price discrimination between retailers;57 and
- the wholesale price is set at a level that allows a sufficient gross retail margin for new entrants to be able to compete, thus avoiding difficulties created under the costs principle (Cave, 2008, p. 51).

At the time of writing, five licensed providers were in the market, including Business Stream,58 although Business Stream continues to hold a market share above 90% (Cameron, 2010). While retail activities account for a relatively small proportion of overall charges,59 WICS states that competition has led to cost savings for customers (WICS, 2009d, p. 4). Retailers can also compete on the basis of service standards, with some offering customers smart metering and other efficiency services (WICS, 2010a, p. 17), as well as environmental advice on both water use and wastewater treatment (WICS, 2010b, pp. 12–13). WICS states that more than 45,000 customers (around 40% of the market) have renegotiated the terms of their supplies in the first two years of the competitive market (WICS, 2010b, p. 7).

which is approved by WICS each year, and must be kept within the price limits set by WICS in its periodic reviews.

56 Market entry is administered by WICS, to whom prospective entrants must apply for a licence under Section 6 of the Water Services etc. (Scotland) Act 2005. Customer switching takes place according to a published Market Code, under which the CMA holds a central register of customers (the Market Code is published on the CMA’s website, www.cmascotland.co.uk).

57 Scottish Water’s wholesale charges scheme is subject to approval by WICS under Section 29A of the Water Industry (Scotland) Act 2002. WICS publishes a template wholesale services agreement to be the basis for negotiations between new entrants and Scottish Water (see www.watercommission.co.uk).

58 The current list of licensed providers can be accessed at www.scotlandontap.gov.uk.

59 In 2008–09 and 2009–10, the retail services accounted for around 11% of bills, although WICS states that this figure will increase with the transfer of activities from Scottish Water to the licensed providers: WICS (2009e, p. 10).
A cost-benefit analysis commissioned by WICS estimated the benefits of competition in the water industry (including price savings to customers, increased profits to companies and carbon reductions) to be around three times the costs, over the period to 2020. This was based on an assumption that competition would develop over the period, with new entrants driving efficiency improvements and capturing market share (Grant Thornton, 2010, p. 5).

6.2.3 Northern Ireland
At the time of writing, there are no plans to introduce competition in Northern Ireland in the same form as England, Wales or Scotland. In our view, it would be difficult to envisage how this could be achieved before separation of the funding of water services from the local taxation system.

6.3 A National Grid for Water

The ‘National Grid’ is a UK-wide network of electricity transmission wires, allowing the easy transfer of energy to where it is needed. Similarly, there is a national network of pipelines that deliver gas to customers. However, in the water industry, there are over a hundred separate resource zones operated by the water companies (EA, 2006, p. 3). In recent years, there has been discussion on the feasibility of developing a National Grid for water, such as by connecting the current resource zones through new pipelines. This is seen as a potential solution to relative water scarcity in some areas (such as south-east England), as water is relatively plentiful in others (particularly in much of northern England and Scotland).

There has already been some development of water grids in other countries. Both Victoria and Queensland in Australia are developing water grids through construction of new pipelines to connect water systems, with many pipelines already completed (State of Victoria Government, 2007, p. 5). Thailand has also plans to develop a water grid, although the project has encountered numerous problems (Molle and Floch, 2007).

However, in the UK, regulators historically have not considered a national grid for water to be necessary or desirable. In 2006, the EA published a paper that assessed the feasibility of water transfers from the north of England or Wales to the south-east through a large new pipeline. This was intended to help meet the

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60 A resource zone is the largest area in which all customers face an equal risk to supply.
expected rise in demand over the following 25 years. The EA concluded that the cost of such a pipeline would be higher than the alternative solution of constructing additional reservoirs in the south-east (EA, 2006, p.1). Similarly, in a review of competition in 2008, Ofwat concluded that the development of a national grid seemed unlikely for the foreseeable future (Ofwat, 2008a, p. 32).

However, water transfers do not necessarily require the construction of pipelines on the scale considered by the EA. Smaller pipelines connecting adjacent geographic resource zones would allow transfers from one zone to another, easing potential supply and demand imbalances (Ofwat, 2010b, paragraphs 14–15). While there are currently some transfers of water between resource zones, there is little trading of water between water companies, and few proposals to do so in the future (Ofwat, 2010b, paragraph 19). This is generally agreed to be a result of regulatory disincentives to water trading (Ofwat, 2010b, paragraphs 20–22).

Commonly cited disincentives include:

- suppliers being required to provide for all water demand in their area. Reliance on water trading is perceived to increase the risk of not meeting demand and being penalised (Ofwat, 2010b, paragraph 21);
- capital expenditure of water companies on their own resources increasing the Regulatory Capital Value on which they can make a return (Ofwat, 2010b, paragraph 20);
- expenditure on water from another supplier being classified as operating expenditure, and thus decreasing the company’s perceived efficiency (Ofwat, 2010b, paragraph 20);
- the costs principle focusing on short-term costs, and so failing to offer water companies a fair profit margin on any water they supply to other companies (Cave, 2009, paragraph 4.4).

In 2009, the Cave Report recommended several changes that would facilitate bulk trading of water between water companies, either by removing past regulatory disincentives or by creating new incentives. These changes included (Cave, 2009, paragraph 4.119):

- obliging water companies to procure the best value supply of water;
- creating new upstream licences for companies introducing water into a supply network;

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62 See also Stern (2010, p. 8).
63 See also Water UK (2010, p. 11); and Seven Trent Water (2010, p. 41).
64 See also Cave (2009, paragraph 4.4).
65 See also Severn Trent Water (2010, p. 41).
66 See also Severn Trent Water (2010, p. 41).
mandating the publication of water supply costs at a resource zone level; and replacing the cost principle, in which access prices are set on a case-by-case basis and which do not support efficient entry, with an ex-ante access pricing framework in which Ofwat sets non-discriminatory and cost-reflective access prices for each water resource zone, at a level that ensures an efficient network operator can cover its costs, while supporting efficient entry.

A Severn Trent report in 2010 endorsed the changes recommended by the Cave Report, and recommended further reforms by Ofwat and the Environment Agency, including (Severn Trent Water, 2010, p. 42):

- requiring companies to consider bulk supplies in their business plans;
- establishment of a code of conduct for water trading; and
- revising the mechanism in price controls whereby the purchase of bulk supplies leads to a negative impact on Ofwat’s assessment of the efficiency of the company purchasing the bulk supply.

Following on from the Cave Report, Ofwat published a study in 2010 on the potential benefits of upstream markets. It was concluded that there were potentially very significant benefits from increasing interconnection between resource zones (Ofwat, 2010b, paragraphs 61–2). The report also mentions Ofwat’s intention to publish a document in 2010 setting out the first steps Ofwat will take to promote upstream competition (Ofwat, 2010b, paragraph 94).

6.4 Smart Metering in the Water Sector

6.4.1 Introduction

Smart metering is in the process of being implemented in the energy sector. There are two important implications of this in the water sector. First, whether the use of energy smart metering will impact on water usage patterns, and second, whether the water industry should also be considering smart metering.

6.4.2 Potential benefits of smart metering in the water sector

Water companies have identified a number of specific potential benefits from smart metering in the water sector. These include:

- provision of improved information on where and when leaks occur, thereby enabling significant reductions in supply pipe leakage;
- producing more accurate bills at lower cost;
• displaying real-time information on water use (thereby encouraging water efficiency);
• simplifying bill management through more timely information; and
• enabling a wider range of tariffs (which, in combination with the above factors, are argued to be able to reduce the potential for bad debts) (CC, 2010b, p. 208).

It is also anticipated that smart metering will facilitate more automatic meter reading and e-billing, assisting water companies to meet environmental and carbon targets. Smart metering, therefore, offers potentially significant advantages to customers and the environment (CC, 2010b, p. 169). In a competitive market, smart metering is a potential means for competing retailers to offer service improvements and efficiency savings to their customers.

6.4.3 Smart metering and the Walker Review

Smart metering was one of the topics covered in the recent Walker Review of Household Charging and Metering for Water and Sewerage Services (initiated in August 2008). The terms of reference are restricted to a review of the water-related charging systems for households and associated issues, including considerations of social policy and environmental impacts. Specifically, the review group was charged with looking at so-called ‘water poverty’ and ability to pay issues. An interim report was published during summer 2009 and a final report in December 2009 (Walker, 2009).

In summary, the final report recommends that the current charging system for water, which is a mix of rates and metered charging, be changed to one which is metered only. The report claims that this would assist, collaterally, more thoughtful water use and conservation. The Walker review also extolled the virtues of smart metering67 and recommends strongly that the utility value of smart meters be investigated fully by the water industry. It goes on to recommend that Ofwat set up a smart meter group to help determine the costs and benefits of smart meters in the water industry.

6.4.4 Bristol Water’s price control appeal

During the most recent price control process, a number of water companies applied to Ofwat to be allowed some revenue for smart metering trials. In the event, Ofwat declined to make an allowance for this stating:

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67 “Smart meters” are measuring devices that are capable of storing data and being interrogated remotely. Currently, most meters installed are “dumb” and need to be read manually and in situ.
we will work with the Environment Agency and other stakeholders to develop a more robust framework and improved evidence base for companies to assess the costs and benefits of accelerated metering and smart metering. If, in light of this work, companies are able to demonstrate a clear case for additional metering, we will consider how to take this forward. (Ofwat, 2009b, p. 54)

One of these companies, Bristol Water, appealed Ofwat’s price control to the Competition Commission on a broad range of grounds. A minor aspect of the appeal was Ofwat’s refusal to allow £2 million funding for a proposed smart metering trial. The Competition Commission agreed with Ofwat’s decision not to include the cost of the proposed trial in Bristol Water’s price limits, stating:

We appreciate that smart meters may bring benefits, but we saw no good evidence that this trial was the most efficient way of discovering if they would. We saw merit in Ofwat’s proposal of an industry-wide scheme, where costs may be shared with possible meter manufacturers as well as other WoCs and WaSCs. (CC, 2010a, p. 33).

7. CONCLUSIONS

Commonly, water services are provided by municipally or state-owned authorities, with prices generally not being set at competitive levels. In some jurisdictions, including parts of the UK, previous statutory authorities have been privatised, and are subject to economic regulation.

Since the first price controls in England and Wales in 1989, economic regulation of the water industry has coalesced around an RPI-X type regulatory regime that has delivered increased investment and lower costs, to the benefit of water customers. Prices have generally fallen over time in real terms, while investment has increased.

A similar price control regime has been implemented in other areas of the UK (i.e. Scotland and Northern Ireland) with the formation of government-owned (i.e. not yet privatised) water and sewerage companies. Similar price and efficiency benefits have been observed there as a result of economic price control regulation. It seems, therefore, that this model of economic regulation could be adopted more widely.

It is important to note, however, that the incremental efficiency gains have diminished over time. This has led regulators to adopt increasingly elaborate techniques to attempt to extract further efficiencies from companies (such as Ofwat’s Capital Expenditure Incentive Scheme). This has resulted in an increasing degree of regulatory complexity and therefore, regulatory costs. This raises the question of the right balance between extracting further effi-
ciencies and the regulatory costs borne by customers, taxpayers and the industry that this entails.

The industry is grappling with emerging issues, including the introduction of competition, which may provide a more sustainable way of promoting efficiency and innovation. Attempts to introduce competition in England and Wales have largely been unsuccessful so far, while retail competition has been introduced successfully in Scotland.

In addition to competition, there is potential for the industry to reap further cost and environmental benefits through measures such as smart metering and increased use of interconnections between neighbouring suppliers, leading potentially to a national water grid.

The UK example may provide an interesting point of comparison with most other EU countries which have until now opted for competition for rather than in the market models. The EU water directives that aim to introduce outcomes closer to economic reality in times of increasing water scarcity may lead EU Member States to adopt regulatory models closer to that of the UK.

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