Water pricing in England and Wales – institutions and objectives

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Abstract Water pricing in England and Wales reflects a range of influences. Cost recovery is generally the primary influence over prices. The privatised public water supply sector dominates water usage. Water abstractions are licensed and allocated mainly on an administrative basis. Charges are levied to recover the water management costs of the licensing authority (the Environment Agency), and are not closely related to the scarcity of water resources, or the environmental impact of abstractions. Public water supplies are subject to price cap regulation. This provides incentives to reduce costs. Public water suppliers are expected to choose an optimal combination of water resource interventions in planning water supplies. The system of regulation has exposed choices. Tariffs for customers reflect company and regulatory concerns to share the burden of cost recovery equitably. Tariff innovation to influence behaviour has been limited by the low extent of metering of household customers. The cost recovery and institutional framework has led to discipline in investment decision-making.

Keywords Abstraction; cost recovery; investment planning; licensing; marginal costs; metering; pricing; privatisation; regulation; resource allocation; tariffs

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Introduction

Water prices are rarely the result of a free market process. The prices paid by water users are usually administered in some way. A range of political, economic or social objectives may influence the pricing of water, beyond the interplay of supply and demand. Recovering the costs of providing water is perhaps the most obvious pricing objective, but this quickly leads onto other issues. In aggregate we may want water users to bear the costs of providing services, but this burden can be defined and divided between water users in different ways.

Other aims may be to influence the behaviour of customers or water users, to manage the demand for water, to allocate water resources efficiently between different users or economic sectors, or to achieve social objectives. Ensuring access to a service essential for public health and well-being at prices which are affordable for all sections of society is a key social objective. So there may be a concern to manage the burden placed on specific groups. Regional issues, for example, ensuring that development is not constrained by the availability of water resources may also be prominent. Finally, environmental concerns about the sustainability of water usage can influence the regulation of water prices. The case of England and Wales illustrates the kind of practical compromises and institutional issues that arise in water pricing.

England and Wales – background

Public water supply is the largest element of water usage in England and Wales, accounting for around 40% of total abstractions. A non-consumptive use (hydropower) is the next biggest, accounting for around 25% of the total. The dominance of public water supply means that issues of allocation between sectors, particularly competition for resources between agriculture and public water supply are less prominent than in many countries. The public water supply industry was privatised in 1989 and is operated as a series of regional

monopolies with long-term operating licences. The industry is vertically integrated, so public water supply companies are responsible for everything from raw water abstraction up to the point of delivery.

Water pricing operates at different levels. Firstly, raw water abstractions from rivers, storage reservoirs or groundwater are subject to abstraction charges, secondly prices apply for bulk supplies of raw or treated water between public water suppliers, and thirdly charges are made to water customers for supplies of water via public mains.

Water abstractions

Abstractions of any significant volumes of water in England and Wales are subject to licensing by the Environment Agency (EA). The EA is the main environmental regulatory body in England and Wales. Among a wide range of functions it is responsible for overall river basin regulation functions including regulating water abstractions and effluent discharges to the environment. These functions are carried out through regional and area offices.

Abstraction licences lay down the terms and conditions under which abstractions may take place. Licences specify how much water can be abstracted, the point of abstraction, the use to which water is put, and often the point at which water is returned to the environment (though not for public water supply licences). They may contain specific conditions that restrict abstractions when river flows fall below defined levels. Similarly there may be an upper limit on daily and annual volumes that can be abstracted. This can allow some flexibility in the timing of abstractions.

Abstraction charges

Water abstractors must also pay abstraction charges to the EA. These charges are usually based on maximum licensed amounts rather than actual amounts abstracted (further investment in metering would be needed for measured charging). Charges vary across regions and are related to seasonal factors, whether the source is "supported", for example by river regulation operations and a "loss factor" based on the net return to the environment. The loss factor is assessed based on the specified purpose of the abstraction. High loss abstractions include spray irrigation, while vegetable washing is an example of a low loss abstraction.

The total revenue recovered by abstraction charges is limited to the costs incurred by the EA in carrying out its water management functions. Charges are set on a regional basis to ensure EA cost recovery at a regional level, as well as at national level. The EA water management costs include those incurred in operating river regulation schemes, such as releases from regulating reservoirs, groundwater or water transfers. This aspect of water pricing reflects the history and structure of water management arrangements. Major water regulation facilities, such as reservoirs that regulate flows on major rivers such as the Severn or Tyne, are now owned by privatised water companies. The EA requires companies to operate these water management facilities in line with operating regimes that are designed to secure wider public objectives. The costs of these operations are recovered from abstractors within that region. This, arguably, recovers operating costs from all the abstractors that benefit from the source reliability that results from river regulation operations. This approach means that abstraction charges do not closely relate to the scarcity of water resources in a particular catchment, or to the local environmental impact of abstractions. The average cost per cubic metre of licensed abstraction is around 0.3 to 0.4 pence (0.5 to 0.6 US cents), compared to prices around 60 to 80 pence (US$1 to US$1.30) per cubic metre for piped domestic water supplies.

At this level, the dominant objective for pricing is cost recovery. Licensing is the main

means of allocating resources, and managing demand. The market has not played a significant role. Allocation between sectors – agriculture, industry or public water supply – is largely determined through a combination of demand for access and regulation. Potential abstractors apply to the EA for a licence and must set out how much water they wish to abstract, the purpose of the abstraction and where the water will be returned to the environment. The EA must ensure that the proposed abstraction will not affect the rights of existing abstractors. Subject to this, and consideration of any representations from interested parties, the EA usually grants licences where it considers that water resources are available and can be abstracted without adversely affecting environmental sustainability.

Review of abstraction licensing policy

The Government instigated a review of abstraction licensing in 1998, partly in response to concerns about the environmental impact of abstractions, and a historical legacy of over-licensing in some areas, in a context of rising demands in some parts of the country. The Government was concerned about the need to ensure that the licensing system allowed sufficient regulatory control. The outcome looks likely to increase the EA's powers to control abstractions, particularly through the use of time limits on licences. Most licences will now be subject to a time limit of 12 years. So the issue of administrative allocation of water resources looks likely to grow over the coming decades, particularly in the drier and economically growing south-eastern parts of England.

In 2001 the EA published *Water resources for the future* a national long-term strategy document for water resource development in England and Wales. The EA indicated that it considered current abstraction licensing to be unsustainable or unacceptable in many parts of the south and east, particularly for summer surface water sources. As time limited licences expire the EA could be drawn uncomfortably into the administrative allocation of water resources between competing interests.

The review of abstraction also explored whether market forces could play a role in allocating scarce water resources. Licence trading is legally possible, but in practice its role looks likely to be limited because few trades will be possible without significant regulatory scrutiny. Most licence trades will be treated as offsetting licensing changes between trading partners, which will be subject to similar administrative processes as applications for new licences. The "seller" will apply for a variation or revocation of his existing licence, with the "buyer" applying for a new licence to abstract an equivalent amount. The environmental – and therefore licensing – issues associated with water abstraction are essentially local in nature, so resources in different catchments are unlikely to be direct substitutes.

International experience, for example in Australia, suggests that transaction costs play a significant role in determining the extent of trading in water rights. This is also reflected in the responses of abstractors to a survey on their attitudes to licence trading. Respondents noted the importance of rapid approvals for licence trades, and the need for some form of brokerage so that trading partners can be found. So far, however, the EA has tended to emphasise the role of administrative tests in licensing decisions. For example, it continues to emphasise the role of its assessment of an abstractor's "reasonable need" in licensing decisions. The indications are that most licence trades are unlikely to be straightforward. This is likely to limit the development of markets with sufficient buyers and sellers.

The Government also considered the extent to which charging for abstractions could be developed to provide desirable economic incentives to abstractors. Environmental costs imposed by water abstractions could be reflected in charges, to encourage more efficient water abstractions and allocation to those whose valuation of water exceeded its environmental cost. A study was carried out to assess the impact of alternative charging scenarios on abstractors' behaviour, but its main conclusion was that most abstractors were relatively

unresponsive to price. Charges would need to be increased by between 150% and 1000% to generate a 15% reduction in authorised volumes. Such increases would lead to major equity and distributional consequences, and the government concluded that the revenues from abstraction charging should remain limited to recovery of EA costs. They did, however, leave the door open to restructuring of charges within the cost recovery envelope and encouraged the EA to consider this.

A more incentive-based approach to pricing could be explored. Firstly, "cost recovery" can be defined to include the costs of compensation payments made by the EA when they revoke an environmentally damaging abstraction licence. In principle, the costs of addressing the generalised environmental impact of water abstraction, through a transition to a more sustainable level of abstraction could be recovered from remaining abstractors. Secondly, within a cost recovery envelope, there could be scope to restructure charges so that they more closely align with the environmental impact of abstractions. But, overall, the likelihood is that prices will play a limited role in the allocation of water resources for the foreseeable future. Over time, if demand pressure increases, resource allocation issues could become more controversial.

Public water supplies and regulation

Most consumptive water usage is supplied via the public water supply systems of 22 privately owned water companies. Water companies are regional monopolies licensed to supply water in defined geographic areas. They have legal duties to develop and maintain efficient systems to meet demands for public water supplies. Importantly, however, there is no precise definition of the reliability of supplies that would be consistent with this duty. This remains a matter for companies to address in their plans, and for regulatory judgement, should there be doubt as to whether this duty is being carried out.

Public water supply prices are subject to independent economic regulation by the Office of Water Services ("Ofwat"), set up when the water and sewerage industries were privatised to protect customers from the exercise of monopoly power, while ensuring that water companies can finance their functions.

At privatisation in 1989 water company assets were sold to investors at a discount to their replacement costs. Price stability for water customers was a consideration for the Government at the time. The level of discount between the privatisation issue price for water company shares and the replacement value of assets, meant that investors could still earn a competitive rate of return on their investment without requiring a major step change in prices for customers. Current prices continue to reflect the terms of privatisation because regulated prices provide for returns on the amount that investors paid for assets, adjusted for depreciation and asset additions since privatisation, rather than their replacement value. Ofwat uses a system of regulated price caps to protect customers. Under this system, price limits are set once every five years on the basis of anticipated costs and assessments of companies' comparative efficiency in delivering services. Comparative efficiency assessments are based on econometric models that relate operating conditions to operating and maintenance costs. Essentially allowed revenues provide for the three main elements of:

- a return on capital employed in providing services,
- the accounting charges necessary to finance the maintenance and replacement of assets, and
- the annual operating costs of running the assets to deliver services.

This price-cap approach gives incentives for water companies to find more efficient ways of delivering water services. The effect of this incentive has perhaps been most important in driving efficiencies in the "value-adding" processes of distribution and treatment. The raw water abstraction charges paid by water companies make up less than 2% of

their total costs, so reducing abstractions is of limited priority in cost control terms. Because of the comparatively limited scope for competition in the water supply chain a very specific form of utility price regulation has emerged, based on comparative analysis. This contrasts with privatised electricity and gas utilities in the UK, where competition has played a more prominent role.

Least cost planning

Ofwat must make allowance for the investments needed to deliver higher standards and meet need demands. Companies put forward business plans to deliver the required outputs. The biggest investments have been in delivering higher environmental and drinking water standards, but companies must also formulate long-term plans to maintain the balance between supply and demand for public water supplies. In doing so they are expected to plan investments based on an optimal mix of water resource development, leakage reduction, demand management or the bulk import of water from neighbouring companies. Choices should take account of financial and environmental costs. These plans also provide the basis for an assessment of the marginal costs of water supplies, that is the extra cost associated with delivering extra units of water. The long-term plans assembled by companies allow marginal costs to be assessed over a longer time frame – in economists' jargon, the "long run marginal costs" (or "LRMC"). Ofwat regards LRMC as an important reference point for regulatory judgements, and expects company strategies on tariff setting, bulk supply pricing and other aspects of planning and service delivery to be consistent with their resource plans and LRMC analysis. In a sense, the LRMC is the "within company" price of any changes that affect supply capacity.

In recent years, leakage reduction has been a major focus, with Ofwat introducing leakage targets for all companies. This followed dry weather in 1995 when the continuity of public water supplies came under severe stress in some regions. At the time it was a public relations disaster, with the public perceiving an incompetent, wasteful industry, whose top executives were over-paid. So leakage became a natural focus of attention in the aftermath. Given public perceptions water companies have since been reluctant to rely on the option to restrict non-essential uses of water ("hosepipe bans") to manage the balance between supply and demand. Ofwat's approach to leakage targets has been based on the concept of an economic level of leakage, that is the level of leakage beyond which the costs of further reductions outweigh the value of water savings (often estimated as the LRMC of alternative supplies). Companies have made significant progress in understanding costs and benefits in this key area of their operations, and leakage has come down by around 35% since its 1995 peak.

Bulk supplies

Companies should also consider if bulk supplies are part of their least cost plans. The prices for new bulk supplies between companies are subject to negotiation. There are also a number of important historic bulk supplies in place, the terms for which pre-date the privatisation of the industry and reflect local and historical circumstances. But if terms cannot be agreed, or if one of the parties to an existing agreement wants to vary terms, the matter can be referred to Ofwat. New bulk supplies between separate companies can improve efficiency in sharing and planning water resources across catchments and company areas. New reservoir developments in crowded parts of the country raise major planning issues. So bulk supplies can be a means of making better use of existing resources. Sometimes they can release benefits through conjunctive use principles, for example where winter storage can support abstractions from rivers during times of low summer flows.

The interaction of the system of regulation and bulk supplies is an interesting area. Because price-cap regulation allows for a return on required investments, there seems to be a natural tendency for companies to prefer to justify investments in their own water resource developments instead of seeking bulk supplies from a neighbour. Companies may also prefer to develop their own water resources to reduce the perceived risk associated with reliance on a neighbour, and the risk of needing to impose demand restrictions on customers. The system of environmental regulation could also limit the development of efficient bulk water linkages between company systems. Water resource planning is about planning for extreme events, so it may be right to build some linkages that are little used under normal conditions. But such linkages may only get built if companies believe that they will not be able to obtain supplies from elsewhere. There could be a temptation to gamble on being able to secure emergency abstraction rights from a minister who would otherwise be faced with the imposition of supply restrictions.

Because of these factors, Ofwat has sought to introduce incentives within the price cap system for new bulk supplies. The idea is to encourage companies to actively seek out opportunities for new bulk supplies. Ofwat has also sought to make clear its stance on the pricing of bulk supplies, if called upon to make a determination. Ofwat has so far made one determination. The key principles for this were that the price was related to long run marginal costs of the supplier, with a large fixed element in recognition that most of the costs associated with reserving a tranche of capacity were not dependent on the actual volumes supplied.

Co-operation in water resources and further bulk supplies between companies could play a significant future role, particularly in regions where water resources are constrained, or where there are doubts about the environmental sustainability of current patterns of abstraction. A number of new bulk supplies have been agreed in recent years between companies in the south of England. In theory bulk supplies should develop to take water from low marginal cost companies to those with higher marginal costs. There still appears to be scope for this, particularly if some current abstractions are stopped on environmental grounds.

One recent example shows how the England and Wales system of regulation has developed and exposed issues. In 1999 the EA argued that abstractions by a water company (Wessex Water) from three groundwater systems in south-west England were causing environmental damage in sensitive areas. In their 1999 business plan the company put forward a case for a £100 million (US$150 million) investment, largely in new long-distance water transfers to replace the sensitive abstractions. This would have implied a permanent increase of around £11 (US$17) per year for water customers in this area.

When the business plan was assessed, Ofwat argued that the cost-benefit justification for such a scheme was not demonstrated and set price caps that did not make any allowance for such a large investment. The company was asked to re-assess more cost-effective solutions. Recently the company, regulators and customer representatives have agreed a way forward, based on leakage reductions, demand management, arrangements to minimise use of sensitive sources and a bulk supply agreement from a neighbouring company. The outcome delivers environmental benefits, but at a much lower cost to water customers. Here the interests of customers, suppliers and environmentalists have been reflected in the outcome. There remains scope for future refinement, as more knowledge of environmental and operational issues emerges.

Objectives in setting public water supply tariffs

At the level of individual water customers, water pricing is most fundamentally influenced by the low level of household metering in England and Wales. Only around 20% of

household customers take unmeasured supplies, although this varies from less than 50% in the drier parts of Eastern England served by Anglian Water to around 3% in the case of Portsmouth Water. As household customers account for 65% of total demand this places an obvious limitation on the objectives that can be pursued through pricing policy, or innovation in tariff structures.

A variety of objectives are apparent in the pricing of public water services. The cost recovery principle is, in effect, built into the statutory framework at an aggregate level, but the pattern of prices is also the outcome of companies' and regulatory objectives.

Price caps are applied by limiting the weighted average increase in a "basket" of tariffs. Within this overall constraint, companies have discretion to formulate their own detailed schedule of charges. Since 2000, these charges schemes have been subject to regulatory approval by Ofwat. But the regulation of charges has not prevented companies from adopting a variety of approaches to the structuring of tariffs. In general companies' tariffs apply across their service areas, despite the fact that some have quite heterogeneous supply/demand conditions in different zones. A concern to maintain price stability has so far outweighed any move to align local costs and tariffs. The exception to this is where the merger of two or more companies has created a larger company. In these cases, separate tariff structures have generally continued.

In recent years companies have responded to customer demand in the industrial sector by introducing a variety of large user tariff options. Relative prices have tended to come down for large users in recent years. This has been justified by the lower unit costs of serving large users, associated with the fact that they do not make use of the lower part of the distribution system. It has also been driven to some extent by the threat of competition in this part of the market, because the regulatory system allows some scope for large users to swap suppliers. In the household sector, tariff innovation has been limited by the generally low penetration of meters.

Four companies have introduced seasonal pricing, but only for large users. The rationale for seasonal pricing is to align prices more closely with costs. This is because the need to provide extra capacity to meet summer peaks in demand is a significant investment driver in many companies, particularly in the crowded south-east where there is relatively less reservoir storage capacity. For many companies, the cost of delivering an extra unit of winter water is only a fraction of that for summer water. The impact of seasonalising tariffs has so far been limited because most industrial users tend to have a flat demand profile. It tends to be household demands for garden watering which drive summer demand peaks.

A related tariff innovation has been the concept of interruptible tariffs. Here a lower tariff is charged in return for a service with a lower level of reliability, that is it is subject to interruption in defined circumstances. This is helpful to some water companies because it allows them greater flexibility in meeting peak demands, while some industrial customers may find it worthwhile to invest in on-site storage. This approach can defer investments in peak supply capacity or allow other cost savings.

Regulation of public water supply tariffs

Ofwat has also sought to influence pricing policy through regulation. Regulatory objectives have generally revolved around preventing undue price discrimination in charges between classes of customers, particularly in comparisons of measured and unmeasured customers or domestic and larger industrial customers. Ofwat has sought to ensure that, on average, bills for measured customers were no higher than those for unmeasured customers, while taking account of the extra costs of providing a metered service. In addition, standing charges for measured customers have been held down, partly to maintain incentives for measured customers to control their consumption.

Ofwat has required companies to justify the level of discounts against standard or household tariffs offered to large users. This has required detailed cost justifications usually based on the extra assets required to serve smaller and household customers. Ofwat has also sought to ensure that tariffs are structured so that they do not encourage customers to waste water, simply to move into a higher consumption bracket and gain larger discounts.

Regulations also provide for social tariffs targeted at particular vulnerable groups. Ofwat has also sought to ensure that prices are structured so that the costs of delivering more water are recovered from those customers driving growth in demand. The latter policy has involved consideration of each company's long run marginal costs, with regulation aiming to ensure that volumetric rates do not fall below the unit cost of delivering (or saving) increments of water. For household customers this has not been a major issue because low standing charges have implied higher volumetric rates to ensure cost recovery. For large users, LRMC has limited the discounts that some companies have been able to offer. Here the pricing objective is more overtly concerned with a signal to customers, and ensuring that those with particular demand characteristics bear the costs driven by their behaviour.

But the role of pricing in influencing demand, or its geographic distribution, has so far been fairly limited. There is little evidence that industrial location decisions are significantly influenced by relative prices. In any case, household demand is generally seen as a more important cost driver, particularly seasonal demand for garden watering. However, the scope for seasonal household tariffs is currently limited by lack of metering, and by practical considerations. In turn the extension of metering is limited by government policy that gives most customers a right to retain unmeasured supplies if they wish. The "optional" approach to metering policy in England and Wales, means that the meters installed tend to be in households where the result will be a bill saving. That is households that already use relatively low amounts of water. This severely limits the demand management impact of metering in the short term at least. It tends to mean that the extra capital and operating costs associated with metering outweigh the value of any water savings.

Evidence from water metering trials suggests that a more targeted approach could generate greater water savings, particularly in "flattening" peaks in demand. Current policy appears to reflect concerns about the social acceptability of allowing privatised companies to impose water meters on customers. Attitudes following the 1995 drought, where the water industry was widely perceived to have failed, may have a continuing legacy here. The door has been left ajar for a more targeted approach because a company is able to apply to ministers for "water scarce area" status, which would allow a more targeted approach. The signs are that social considerations, including the possible impact on lower income groups, will weigh heavily in considering any application.

One anomaly of water pricing for measured household supplies is that water consumption also forms the basis of charging for sewerage services. So customers that use large volumes of water also pay higher volumetric sewerage bills, on the assumption that they generate higher demands on wastewater systems. But this is a simplification. Garden watering, for example, does not affect sewage volumes. This could be an area where charging increases in sophistication in future.

The role of cost recovery

The cost recovery objective dominates water pricing in England and Wales. Concern about the environmental impact of water abstraction has led some to suggest that prices are "too low" because they do not reflect external environmental costs. Environmental objectives could imply higher charges either for raw water abstractions or for public water supplies. But this could conflict with social and economic objectives in providing access for

consumers to safe water supplies at low cost. The external social benefits of a safe water supply industry are likely to be very large. The role of pricing, with or without consideration of environmental or other external costs, in allocating resources efficiently has generally been secondary.

The application of cost recovery has, however, provided for discipline in considering costs and investment decisions. The structure of regulation has also been influential. Price-cap incentives have encouraged efficiency in service provision, allowing bills to go down by 12% in 2000 when efficiency gains were passed onto customers. Regulatory scrutiny has also played a role, for example in the role of leakage targets. Within the overall cost recovery framework, pricing innovations could still develop to manage seasonal and geographic variations in the balance between demand and supply. But this is still likely to be subject to social objectives, for example customer choice in metering, as well as practicality in implementation.

Even with a privatised industry, water remains a matter of public policy. Political and social concerns are alive and well as key influences on the pattern of water prices.

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