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A FRAMEWORK FOR VALUING WATER IN ENGLAND AND WALES FROM 2015 ONWARDS

Jon Stern and Dr Jonathan Mirrlees-Black
Centre for Competition and Regulatory Policy (CCRP)
City University London

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Non-Technical Summary

This paper sets out a recommended strategy for how Ofwat can regulate the Resource element of the England and Wales water supply industry. Its starting point is the April 2011 Ofwat Future Price Limits (FPL) preliminary model informal consultation document.

The FPL consultation document suggested an updated framework for water industry regulation with two main sets of developments. The first set is a more outcome and customer focused framework that makes better use of market mechanisms where appropriate. The second set refers to water sustainability and environmental benefits. The latter requires more efficient and sustainable abstraction and use of water, particularly given the currently predicted impacts of climate change on water availability. This paper addresses both of these sets of issues but we do so from the perspective of obtaining a reasonable and robust measure of the "value of water" recognizing, of course, that the value of water varies considerably around the country both within as well as between water companies. We see obtaining a proper Resource value as the foundation for effective regulation of the water supply industry, including at retail customer level.

The paper has as its main objective the design of a framework for valuing water in the next price control period (PR14) and beyond, i.e. for the medium-term period 2015-2020/25. However, the paper addresses this in the context of what would be the most appropriate long-run market and trading framework for the efficient abstraction and use of water in the long-run, i.e. post 2025. Hence, the medium term concerns of the paper are not just to provide a more effective regulatory framework in the medium-term but can also represent a first step in the development of a longer term framework as and when currently binding constraints can be relaxed.

The paper is written against a background of considerable policy uncertainty. In particular, it is unclear, firstly whether, how far and when retail competition for water supply in England and in Wales might be expanded from its currently very restricted amount; and, secondly, whether and, if so, when scarcity based abstraction prices might be introduced. Both of these changes (and other market underpinning changes) would require new primary legislation. In consequence, the paper is written to provide a regulatory framework for setting the value of water that would work more effectively

than the current one: (a) both with and without an expansion of retail competition, as well as (b) with and without "real" paid scarcity based abstraction prices.

Our proposed framework without either of these policy changes would, we suggest, provide a better regulatory basis than the current one but it would have very weak incentives to evolve into a first-best long-run market and trading framework. We discuss this limited model in Section 4.3. However, our main focus is on a model with a substantive expansion of retail competition to non-household customers but probably without explicit scarcity based abstraction prices - at least for PR14.

The April 2011 FPL informal consultation document briefly discusses the use of "shadow" abstraction prices and we discuss at some length how these might be used for WRMP (water resource management plan) investment appraisal purposes in the medium-term. This would be valuable in its own right for improving the quality of investments as well as for providing a better basis for the development of "real" paid abstraction prices.

We set out the objectives and constraints both in the medium-term and the long-term and appraise the options for developing a Resources element that would deliver a reasonable and robust set of water values around the country.

The main objectives are to provide effective signals (a) for the right level and type of investment (in both new resources and network infrastructure; and (b) for efficient water resource use. Given the length of life of new water industry investment, we attach greater priority to the first of these. For the medium-term, we also attach considerable importance to the objectives of a flexible framework and evolutionary potential (i.e. a model that can readily evolve in response to the development of competitive markets).

As regards constraints, for the long-term we assume that there are no major binding constraints. For the medium-term (and for PR14), we firstly have to have a model that could attain at least some part of our objectives with and without "real" scarcity based abstraction prices. In addition, it needs to provide manageable change for the industry and to maintain the confidence of debt and equity investors. Ofwat has made clear that no mandatory unbundling will be required in PR14 beyond accounting separation and that current RCV protection will be continued until at least April 2015. We accept these constraints for the medium-term. In consequence, our recommendations for a medium-term model incorporate those requirements while also including in-built incentives for evolution towards a fully market based water supply industry framework in the long-run.

For the long-run, experience in regulated energy and other network industries suggests that the most relevant models for E&W water are (i) vertically integrated area-based models, (ii) pool models and (iii) bilateral contract models. The last two of these allow a clear and unambiguous valuation of water resources; vertical integration does not.

The FPL document makes clear that there are major disadvantages with the first given the development of the industry (and of regulation) over the last 10-20 years. In consequence, it is now time to move on to a water supply industry model that is more

transparent and incorporates explicit upstream and retail markets with much more open entry. We agree.

Considering experience in other sectors, we are also clear that the water supply industry does not need the complexities and rigidities of a pool model and that therefore the recommended long-term model for water supply in England and Wales should be a bilateral contract model. Under the latter, upstream water suppliers sell water directly to final consumers (probably excluding households) and to local supply companies across an unbundled network. This model could also readily accommodate abstraction licence trading.

For the medium-term, given the constraints set out above, we conclude that the main alternative to vertical integration is a "BST" (bulk supply tariff) model and that is what we recommend. Under a BST model, the incumbent water company is required to offer water at a 'default' regulated wholesale price, but wholesale and retail parties eligible to trade can do so bilaterally outside this mechanism. The first stages of introducing wholesale competition in energy and other regulated infrastructure industries throughout the world have effectively used a BST approach and the post-2008 Scottish Water structure is a BST variant (in some market contexts, the BST is termed **"the price to beat"**).

As has been shown a number of times in electricity and gas, BST models provide a useful way by which new entrants can enter wholesale markets as well as a method for developing retail competition. BST models also provide a good way of valuing water as a resource; they work well with real scarcity based abstraction prices and adequately with shadow abstraction prices for investment appraisal. Finally, although far from ideal as a long-term model, they certainly can provide an adequate long-run model that is superior to vertical integration.

There are several types of BST model and we discuss and appraise three of them. They differ as to whether and how far there are separate price caps for – and within - network services. Using the FPL framework, the first model that we consider has separate price caps for Resources and Network Plus *and* a separate price sub-cap for pipes within a Network Plus price cap. The second model has separate price caps for Resources and Network Plus but *no* separate price sub-cap for pipes within Network Plus. The third model has a single price cap for wholesale treated water that combines resource and all Network Plus elements (like Scottish Water).

We recommend the first of these three models for the medium term and PR14, i.e. a separate company level regulated BST for raw water (a Resource price cap) plus a sub-price cap for all within-company raw and treated water pipes to operate within an overall Network Plus price cap. This combination imposes a "collar" implicit price cap on non-pipe Network Plus elements.

The main reasons for our recommendation are, firstly, that it provides a more transparent view of the value-chain and is therefore much easier to regulate; and, secondly, that it

requires incumbents to provide a clearly specified set of network services with clear network access rules and (regulated) access prices for pipes and access rights for treatment works, system operation, etc. This is a model that can and does support the development of wholesale competition – and of interconnection between water zones and companies. This model, unlike the other two models, has provided an effective evolutionary basis for electricity and gas to evolve over a 10-20 year period from vertical integration into a robust long-run structure with effective wholesale and retail markets.

For use in PR14, our recommended model's viability depends on being able to develop network pricing rules for raw and treated water pipes at company level. We argue that this can readily be done in the first instance using simple "postage stamp" tariffs. This, with other details of our recommended model is discussed in detail in Section 5.

The key point for the BST is how it would be set. We recommend that it be set to reflect the long-run marginal cost of new supplies of water. In particular, we recommend that the BST would be calculated at company level by aggregating the LRMC for each WRMZ (water resource management zone) as reported in WRMP's. If "real" scarcity based abstraction charges were in place, these would be added to the LRMC-based prices for water-scarce areas, aggregating from catchment zones to WRMZ's. If only shadow scarcity based abstraction prices were available, the investment appraisals in the WRMP's and business plans should be carried out using these shadow prices. It may be that using LRMC prices in this way might result in over or under-collection of resource costs; if so, we suggest transition mechanisms (including perhaps network price adjustments) to adjust and "true-up". These issues are all discussed at greater length in Sections 5.1 and 5.6.

The paragraph above may seem to suggest a complex structure. It is not. It follows well-established models in energy and other regulated infrastructure industries. The use of LRMC for a Resource element has also recently been suggested by Severn Trent with Ernst & Young, although their recommendations are in other respects significantly different from ours and retain much more of a vertically integrated framework.

If our recommendations for E&W water supply were adopted for PR14 and accompanied by a significant expansion of retail competition, we believe that it could encourage retailers to exert greater pressure for lower costs and wholesale prices within incumbent companies – including the buying-in of wholesale water from other suppliers and the development of interconnection within and perhaps between companies. That may well require substantive changes to the culture and management methods in many water companies but shareholder and other pressures could well promote such changes.

Even if the resulting degree of competition in the market were relatively small, we would still advocate our recommended company regulated BST model with a separate network price cap and sub-cap as the best available for the medium-term and, if necessary, beyond. In our opinion, this is the model that, within the FPL framework and constraints, most effectively sets a Resource value of water and gives the strongest likelihood both of

achieving a market based approach to water industry efficiency and of ensuring an environmentally sustainable E&W water sector.

1. Introduction and Scope of Paper[1]

Proposals for the reform of the water supply industry in England and Wales (E&W) have proliferated since the publication of the Cave Review in 2009. Most recently, Ofwat published their proposals for the structure and regulation of the E&W water industry in their Future Price Limits framework paper in April 2011. In addition, UK experience with retail competition has been accumulating since its introduction in Scotland for all non-household customers in 2008.

Much of the water reform discussion has focused on retail competition. However, there has also been a strong thread concerned with upstream competition, abstraction licence and bulk water trading[2]. A particular concern – but much less discussed - is how to establish "the value of water". In fact, of course, there are multiple different "values of water" differentiated by location, and date. (The "value of water" is hence a vector if not a matrix of numbers and emphatically not a single scalar variable.) In what follows, it should be clearly recognized that we use the term "the value of water" to denote a large set of values in the same way that "the daily electricity generation price" is in fact the average over a number of different plants meeting a demand load curve that varies very considerably over the day – and similarly for gas.

The issue of "the value of water" was covered to a limited extent in the Cave Review while the subsequent Walker Review (2009) on water affordability placed much importance on it but did not itself address its measurement. Hence, how "the value of water" should be defined and how it might be computed at the level of regulated regional water companies has been little discussed. That issue is the topic of this paper.

The focus of the paper is how best to identify and compute "the value of water" after 2015 in the context of Ofwat's Future Price Limits (FPL) framework as set out in the April 2011 informal consultation document. This framework, for water, envisages at least a separate price cap for retail sales of water (e.g. for monopoly retail segments), and at least one wholesale price cap. However, it is also envisaged that there may be a separate price cap (a) for the Network elements (raw and distributed water pipe networks, treatment works, reservoirs, etc.) – Network Plus in FPL terminology; and (b) for the Resources element, water abstraction plus upstream management and sales.

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1 This paper has been written with financial support from Ofwat. We have received helpful comments on an earlier draft from Jon Ashley, Keith Harris, Gordon Hughes, Tom Kiedrowski and others. However, the responsibility for the analysis and views expressed in the paper rests solely with the authors and it does not necessarily reflect the views either of Ofwat or of any of its staff.

2 See Cave Review, Stern (2010) and (2011), Severn Trent (2009), Ofwat upstream competition, Anglia, etc

It should also be noted that the possibility was raised in the Ofwat FPL Consultation Documents of sub-caps, particularly within Network Plus. This is important in the context of Resource market and sales arrangements and an issue which we will take up later.

It is proposed that the Resources element of integrated, regulated water companies would hold abstraction licences, manage abstraction and would supply water retailers with water using Network Plus services. Ofwat have defined the purpose of the proposed Resources unit as "…[to] focus on providing water resources efficiently"[3]. Hence, the sales prices of water from Resources sets the "value of water" for that company. The question is *how* that might best be done which we discuss in what follows.

In this paper, we discuss how the sales prices for water from the Resource part of existing water companies – raw water and treated water – might be determined and, where necessary, regulated. We consider potential long-run market structures with fully competitive upstream abstraction and wholesale bulk water markets, underpinned by a robust "value of water" deriving from explicit upstream water and abstraction rights markets. However, our main focus is on medium-term developments consistent with the FPL framework that would establish a clear "value of water" for the Resource elements of the current vertically integrated regulated water companies. This would also establish a transparent marker price for potential upstream competitors – new entrants as well as neighbouring and other incumbent water companies. The resulting regulated company Resource price might well be embedded in a post-2015 Ofwat-determined price cap.

The approach that we propose for the medium term has two main components. The first component is a company-wide, efficient forward looking marginal cost – the long-run marginal cost – of increasing existing water resource supplies[4]. The second component is an abstraction cost. Climate change predictions suggest that England and Wales (E&W) can expect growing water shortages over the next 30 years, particularly in the densely populated, higher income South, East and South-East of England[5]. Water shortages impose a significant environmental cost from over-abstraction but this cost is an externality comparable to the other environmental burdens that require explicit government intervention. This externality cost needs to be added to company resource-related costs in establishing "the value of water" in areas of the country where the use of within-area water resources cannot meet demand without significant environmental damage.

The standard first-best economic solution would be for the government to introduce a set of scarcity based abstraction prices into abstraction licences. This may happen, but it would need new primary legislation and it could be highly controversial. Moreover, scarcity based abstraction prices set now for water *use* would be too low for 2030-40 if climate change impacts are as serious as or worse than predicted. But, a very high proportion of water supply investments installed over the next decade will still be in

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3 See Ofwat FPL Consultation Document (2011), p.23.

4 In the long-run, regulated LRMC prices would be replaced by market determined prices.

5 See Cave (2009) and Environment Agency publications. Stern (2010) contains a discussion of these issues and an extensive set of references.

operation in 2030-40 and later. That suggests the potential application of *shadow* scarcity abstraction prices in investment appraisals for major investments in regulated companies over the next 10 years or so.

We discuss all of these issues in more detail in what follows. Although our main focus is on a framework for setting the "value of water" in the medium-term for regulated E&W water companies, we do this within a setting of an appropriate *long-run* market structure for water competition and trade (e.g. for 2025 or so and later). We do this to try to ensure that the medium-term recommendations have sufficiently powerful incentives to be likely to evolve into effective and efficient long-run market structures for the E&W water supply industry. The resulting discussion therefore includes significant discussion *both* on future water industry structures (e.g. the appropriate degree of network-service separation over time) *and* on abstraction issues and pricing.

We assume in what follows that there is a significant increase over the next few years in the number of retail water customers who have the legal right to choose their supplier of water and accordingly the size of the market open to competition. The Cave Review recommended moving towards the Scottish framework where all non-household consumers can choose their suppliers. The government has yet to decide its policy on retail competition and how far it wishes to extend current limits in England. However, we also discuss the case should retail competition not be extended from its current narrow scope – as the Welsh Government has so far proposed for water supply in Wales.

Note that our proposed medium-term model, although some way from ideal for the long-term, is intended to be a feasible and adequate regulatory option for Ofwat for 10-15 years. It should provide a firm underpinning for regulating water companies since the Resources element provides a reasonable and robust "value of water" for all downstream activities. This might well apply should there be little or no development over the next 10-15 years in: (a) retail water supply competition; *and/or* (b) scarcity based abstraction (and discharge) pricing; *and/or* (c) the vertical separation of water company functions beyond accounting separation.

Our recommended long-term model assumes that significant progress can be made on all three of these which, if achieved, would clearly provide a superior industry, market and regulatory framework for 2025 and beyond than the medium-term model, as we discuss in later sections. However, we have deliberately proposed a medium term "value of water" based model with significant internal incentives to evolve towards a long-term market based resource and wholesale trading water model - provided that there is sufficient progress in coming years on (a) - (c) above.

The form of the rest of the paper is as follows. In Section 2, we briefly discuss in more detail past proposals for water industry resource pricing and structures from the implications of the Scottish water reforms and the Cave Review through to the FPL framework. Section 3 discusses industry reform objectives and constraints, both medium term and long term, which provide the basis for appraising the relative attractiveness of various long-term Resource (and downstream) market design options as well as medium-

term FPL related options. By definition, we assume that constraints on market structure and separation of water company elements become less binding over time.

In Section 4, we discuss the main options and make our recommendations for a medium-term model for Resources to provide a way of establishing a reasonably robust "value of water". In Section 5, we discuss some more detailed issues regarding our recommended medium-term model and, in Section 6, we summarise our proposals and suggest priorities for future work for PR14.

2. Water Supply Industry Reform Options – Implications for E&W Resource Markets

In this section, we discuss the various reform options that have been proposed for the structure of the E&W water industry, focusing on issues affecting the efficient use of water resources. We start with the lessons from Scottish retail competition within a (geographically) large area before turning to the Cave Review and concluding with the Ofwat FPL framework structure. The section concludes with a short listing of the main abstraction limitation options for handling regional water scarcity and their interaction with structural and market choices.

2.1 Lessons for E&W from Scottish Retail Competition – Interconnection Incentives and Disincentives

The starting point for most of the recent UK water reform discussions has been the introduction of retail competition in Scotland. This happened in 2008, allowing all non-household customers to choose their supplier. The resulting industry structure is that Scottish Water (an unincorporated, state-owned company) has established a legally separate retailing arm within a holding company structure – Business Stream. There are currently four suppliers competing with Business Stream for non-household customers, but all of them must buy their (treated) water and all network services from Scottish Water. As in E&W, there are no scarcity based abstraction prices even though, as in E&W, water resources vary from surplus to scarcity following a west to east pattern.

In the Scottish water supply industry, there is no upstream competition, no network-service separation and no common carriage obligations[6]. In consequence, there is nothing resembling the Resource entity as has been proposed by Ofwat for the UK in the FPL preliminary model consultation. In terms of price caps, there is a wholesale price cap for Scottish Water which bundles together all resource, network, treatment, wholesaling and other non-retail costs. Hence it is a price cap for wholesale *treated and delivered* water. For retailing, there is a (nationally uniform) regulated household retail price and a default price for the competitive retail market (with actual prices and services in the competitive market increasingly deviating from the default).

The Scottish retail market is clearly contestable and WICS (the Scottish water regulator) argues that there have been significant economic benefits from the introduction of retail competition. The 2010-11 WICS Annual Report claims that the introduction of retail competition has led to economic benefits to Scottish water customers of £330 million in NPV terms. However, the bulk of these benefits appear to result from Business Stream winning tenders by improving its efficiency, costs and prices rather than from

[6] In Scotland, common carriage obligations in water are currently illegal is not permitted unless Scottish Ministers approve them. Section 29E of the Scottish Water Act 2002 (amended) provides a framework for contestability of services although in our view its provision falls well short of encouraging such developments.

competition *in* the retail market[7]. WICS does not provide figures for the number of customers who have switched suppliers but, in 2010, Waterwatch Scotland claimed that Business Stream had more than 90% of customers, presumably over 90% of *eligible* customers[8]. (Eligible customers are those permitted by law to choose from whom they buy their water.) Moreover, the December 2010 Grant Thornton cost benefit evaluation concluded that "CMA data shows that to date there has been a minimal amount of switching by business customers from Business Stream to other suppliers"[9] (although of course customers remaining with the dominant supplier have been able to negotiate better prices and terms of service).

The pros and cons of the Scottish retail competition reform are clearly well outside the scope of this paper but, as regards water resources and their valuation, it is relevant to note the following:

(i) Since Scottish Water is a state-owned, unincorporated business with an area-wide monopoly, the incentives for profit maximization are weak. However, there are clearly powerful incentives for retail sales maximization. Nevertheless, given a reasonable degree of regulatory pressure, even without retail competition, Scottish Water should, at least in theory, have relatively strong incentives to cost minimize on its use of water resources and to take full account of resource-network cost trade-offs. This includes both short-term trading and scheduling and longer-term development of alternative water resources, efficient discharge management, etc.

(ii) A particularly important issue is that Scottish Water has an undistorted incentive to build interconnector pipes between lower cost and higher cost water areas because there is just one water infrastructure operator for the whole of Scotland. The trade-off between network expansion – particularly area interconnector expansion – and water resource investment is, unlike the E&W position, not distorted by the incentive to use own rather than other company water resources. Nor are there security of supply concerns over water imports and exports or problematic RCV allocation issues for interconnector investments as in E&W. Hence, at least in theory, there are quite strong incentives for economically efficient internal upstream bulk water transfers and interconnection investment.

(iii) Retail competition with a significant number of major players actively competing with Business Stream should significantly *increase* the

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7 In the 2010-11 WICS Annual Report, the Chairman, Sir Ian Byatt, refers to Scottish Water "sharpening its pencil" as a result of the introduction of retail competition.

8 Waterwatch Scotland (and its website) closed in August 2011. But, for a report on the Waterwatch findings, see http://www.bbc.co.uk/news/uk-scotland-10976726

9 Grant Thornton (2010), p.4. In the published version on the WICS website, there follows a piece of blacked out text which presumably gave the relevant statistics but which appears to have been redacted.

> incentives for Scottish Water to develop upstream (internalized) trade as well as for commercially based expansion of interconnector pipes that widen the scope of the market. The main advantage of the horizontal monopoly is that the economic and commercial incentives are correctly aligned for trade-offs between resource use and network expansion - and, in particular for inter-area network interconnector investments (within Scotland) – at least provided there is a significant level of active retail competition.

The picture above is encouraging, but it also needs to be remembered that Scottish Water is only a relatively recently created company, put together in 2002 from regional companies previously assembled from local water companies. Hence, the management operates in a framework of a localist past historical background. That must raise questions as to the practical power of the incentives set out above, particularly since the retail water sales market for business customers has not yet graduated from contestability to significant market shares of other suppliers.

Nevertheless, at least theoretically, the Scottish picture contrasts markedly with that in E&W where the development of resource and upstream trading markets is significantly and adversely affected by the numerous barriers towards building inter-company interconnectors. This unambiguously restricts the scope of upstream water markets both in theory and in practice, thereby greatly diminishing the potential for welfare improving network expansion relative to the development of within-company water resource use[10]. These barriers are well known by government, regulators and companies.

The importance of this issue is shown by the fact that more than one of the south and south-east water companies did not incorporate in their 2009 WRMPs (water resource management plans) interconnectors identified as economically beneficial in WRSE modeling. The Ofwat 2010 paper on upstream markets identified 10 potential South-East and East Anglia water company raw water interconnectors that appeared to provide significant economic benefits but which had not been included in company 2009 WRMPs. Overall, the Ofwat analysis suggested potential NPV savings of approaching £1billion in NPV terms from the 30 E&W raw water interconnector schemes that they examined which had been omitted from 2009 draft WRMPs.[11]. (Note that this figure omits potential benefits from expansion of any possible treated water interconnections). As discussed in Stern (2010), the disincentives for inter-company interconnection must be a factor in the low and stable levels of inter-company water trade (under 5% of delivered water) in the face of growing water resource shortages.

For E&W, the economic and commercial incentives for inter-company interconnection are very weak, firstly, because they open up retail markets to competitor upstream suppliers; and, secondly, because it is unclear in which company's RCV the interconnector investment is scored.[12] In consequence, the low levels of interconnection

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10 See Ofwat (2010), Stern (2010) and (2011).

11 See Ofwat (2010) p 18-19.

12 See DEFRA (2010) for an analysis of barriers to interconnection.

imply serious regional "transmission constraints" which seriously restrict the scope of upstream markets – and hence of effective resource markets. This is made worse by the absence of scarcity based abstraction prices.

The consequence is that, in E&W, the margin between the price of own-company water and imported water has to be very high before water is imported other than to alleviate major shortages. This is a problem that the Scottish water industry does not have and, unless resolved, is likely to continue to impede the development of E&W upstream water trading as well as effective water resource use and valuation.

Looking ahead it is clearly possible that any major expansion of retail competition could worsen the incentives to build inter-company interconnection so as to protect the position of within company upstream asset use. For this to reduce the *net* level of interconnection investment in E&W, there would have to be a greater effect from this adverse disincentive effect relative to positive effects from growing water company retail arms. The latter arises because retail sales opportunities involving more interconnection may be revealed and this could provide an offset; but, on balance, the net effect could well be negative. This is in contrast to the Scottish position, where the economic disincentive effect is absent and only the positive effect is relevant.

The key point is that with retail competition the potential loss of market share from market expanding inter-company interconnection is larger and hence more costly than in its absence. (It is worth noting that the disincentives for building new interconnection have frequently been blamed for weak international market linkages in EU electricity and gas markets.)

In Scotland, the single large wholesale company means that further significant development of active retail competition is not only more likely to build inter-area interconnection but that, in addition, commercial negotiations over access terms are more likely to reveal information that enables the regulator to act to remedy anti-competitive abuses. In E&W, the lack of any bulk supplies proposed at PR09 illustrates these problems.

The issues for E&W above have been recognized and directly or indirectly addressed in the Cave Review, some company reform proposals and elsewhere[13]. However, as yet, the issue of how to remove interconnection disincentives remains totally unresolved – indeed it is noticeable how limited is the information available on either the economic or the engineering benefits and costs of greater inter-company interconnection of treated and raw water networks.

Unless this issue can be resolved, it is difficult to see how regional or national abstraction trading or upstream bulk water trading markets can develop – with serious consequences for the scope of longer term resource market development.

[13] See, for instance, Stern (2010) and (2011).

2.2 The Cave Review

The Cave Review was aware of the issues above but took a different tack, not least because of its terms of reference which focused on a review of competition and innovation in the water and sewerage industry.

The Cave Interim and Final Reports clearly recommended an expansion of retail competition towards the Scottish position where only household customers face a monopoly supplier. The Review also discussed abstraction issues but its discussion of what we have termed Resource issues was subsumed into its appraisal of alternative water industry structures.

The Cave Review examined three possible water industry structures, intended as possibilities to be introduced within a 3-5 year period. These were:

(i) continued vertical integration but with an economic purchasing obligation (EPO) under which companies would be obliged to purchase its water from the cheapest source – from own or other companies' water resources;

(ii) competition for the market, where a central agency procures water and waste water services – in practice such frameworks become variants of the "single buyer" model; and

(iii) bilateral trading between upstream (wholesale) and downstream (retail) water sellers over a separate network (including treatment and related services).

The first option was supported by Severn Trent who, in 2009, published a paper strongly advocating a highly regulator-driven economic purchasing model. The second option received no support and attracted some strong adverse comment.[14] The bilateral trade option was strongly opposed by the water companies because it required significant functional if not legal separation. They were also very concerned about the implications for the RCV arrangements and the implications for investment financing and the cost of capital.

A little discussed point is that the results of the Cave Review cost-benefit analysis showed that the highest *gross* benefits came from the bilateral trading model. The gross benefits from the EPO were relatively small. However, the estimated *net* benefits of the bilateral model were strongly negative. That was because the associated costs were extremely high, primarily because of the projected financing costs associated with unbundling the companies and its impact on the RCV.

The purpose of the Cave Review was to find a way forward that could be implemented in the next 3-5 years. For that, the EPO option was the only real possibility. It may have

[14] See Stern (2009) and others.

had only small expected gross benefits but the lack of any need *either* for new institutions *or* for company reorganization (plus its relatively low implementation costs) meant that it seemed relatively attractive.

However, the key point for this paper is that, unlike the other options, the EPO model is very poor at signaling a "value of water". The competition-for-the-market (single buyer) model is better at this and the Cave Review tried to outline a path by which the EPO model might evolve in that direction e.g. via the development of functionally separate system operator. However, the single buyer model has a strong bias towards gold-plated over-investment and, because of information asymmetries, is extremely difficult to regulate[15]. Since it also requires water companies to give up managerial powers and to impose a significant internal level of separation, it is not surprising that this suggestion has received no support from companies, regulator or government.

The bilateral trade model does not suffer from these problems and clearly does establish a "value of water". The problem is that it does require significant vertical unbundling and requires major financial re-engineering. Hence, the introduction of an effective bilateral trading model into any infrastructure industry dominated by vertically integrated companies typically takes 10-20 years. This is broadly the time-scale that has been required in the UK, US and EU electricity and gas industries.

Bilateral trading can and does create upstream markets which, for water and with an appropriate abstraction pricing regime, can provide effective signals on the opportunity costs of using local versus imported water and for current versus future water use. However, it is clear that this option is only a possible long-run option and not one for the medium term – it goes much further than the FPL framework would imply. Hence, to provide effective signals for water resource investment and use in E&W in the medium term, we need to look at less ambitious options than bilateral trading, not least to allow the relaxation and potential removal of the financing and other constraints identified in the Cave Review.

2.3 The Ofwat FPL Preliminary Model

In March 2011, Ofwat published an informal consultation on a preliminary version of its Future Price Limits (FPL) model. However, most of the choices on key model components and boundaries were left open so that it is more appropriate to call the consultation an FPL 'framework'.

The March 2011 document made some things clear. One major point is that the framework was describes as "evolutionary" with the expectation that it would develop beyond 2020 " … to develop and facilitate market mechanisms where this is appropriate"[16].

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[15] The competition-for-the-market model may have more attraction in sewerage than for water supply, particularly if combined with a contract tendering approach for large projects.

[16] Ofwat (2011), p.43.

For the medium-term, points clearly established in the April 2011 informal consultation included:

(a) The main (accounting-separated defined) business units identified were Resources, Network Plus and Retail;

(b) Retail services would be regulated separately from wholesale services; and

(c) There would be separate retail and wholesale price caps for water supply and sewerage including at least one wholesale price cap for each[17].

Beyond this were a number of options. In particular,

(i) For each of water and sewerage, it was left open as to whether or not there might be sub-caps within wholesale or, indeed, within, Network Plus; and

(ii) The pricing model and regulatory structure for Resources was left very open. There was some reference to setting 'regulatory contracts', but the scope and method of these was left for further discussion[18]. . However, there was a reference to a " … [possible] sub-cap for resources within a global wholesale control performing as a proxy for [a] more contract-based way of regulating"[19].

This paper is primarily intended to provide possible answers for water supply to issue (ii). However, as will be discussed in some detail in Section 4, the question of whether or not there will be sub-caps within wholesale – and within Network Plus – are at the heart of our analysis. Scottish Water faces a single wholesale cap covering both upstream and networks but the Cave Review opens up other possibilities which the FPL consultation document extends. In Section 4, we make specific recommendations on both of these sets of issues.

The informal FPL consultation document mentioned that the eventually chosen model would have to be able to work both with and without explicit abstraction prices[20]. It also specifically mentioned the possible use of a "shadow value of water" in the price review process[21]. We discuss this in the next section.

The Cave Review suggested consideration of a functionally separate system operator (SO). This has been pursued by Ofwat who had a consultation on the issue. Following critical comment by the regulated companies and several members of the Ofwat advisory

17 Ofwat (2011), P. 30.
18 Ofwat (2011), p. 24
19 Ofwat (2011), p. 33
20 Ofwat (2011), p. 33
21 Ofwat (2011), p. 39.

panel, this suggestion was withdrawn as a mandatory requirement. (There is, of course, nothing stopping individual companies if they so chose from separating out either functionally or legally their SO units - or, indeed, their pipe networks.)

We will briefly discuss the choice of SO location and some other operational facilities in Section 5.

In the next section, we discuss objectives, constraints and overall choice of water supply model.

3. Objectives and Constraints – Recommended Choice of Long-run and Medium Term Water Supply Models

In this section we set out our views of objectives and constraints. We use this framework to appraise water supply resource options and their implications for the medium term and long term.

Market reform of the water industry is not an end in itself. The aim of market reform is to deliver a framework that will lead to a better outcome for customers, in terms of the price, quality, and sustainability.

In discussions about what kind of market reform is appropriate, it is vital to be clear about the objectives of reform as well as any constraints imposed by the current environment. This may appear obvious, but in discussion those that are both for and against reform can lose sight of what we need to achieve.

We stress a distinction between objectives that are appropriate for the medium and longer term. By the medium term we mean what can be achieved by the time new price controls can be set for 2015-20, and may evolve during the following price control period (2020-25). The longer term, therefore means the period beyond 2025.

This distinction is important, as it ensures that there is focus on ensuring that the most important effects of reform are achieved. For example, in the medium term it is not an objective for there to be a highly developed market for water services which sends perfect price signals to water market participants, with frequent trading. That might be an outcome in the very long term. However, in the medium term, the objectives are still significant, but very different.

We note that there are a range of constraints which may limit what can be achieved in the medium term. In the long term, though, we assume that there are few constraints. We would argue that any perceived constraints can, over a fifteen year time horizon, be met or mitigated through alternative policies.

3.1 Objectives

In table 1, we set out the key reform objectives, which we discuss in more detail in the sub-sections below.

It is worth highlighting that we place the greatest emphasis on facilitating long term decisions in the medium term. Prospective investment levels are large and very long-lived so that the costs to consumers will be highest if the investment programme is suboptimal, or significantly larger than it need be. Using price signals to ensure efficient water use are important, but we think it more realistic for the appropriate mechanisms for this to develop progressively. *We therefore focus in the medium-term on ensuring that water resource signals (including scarcity elements) concentrate on ensuring that*

investments in services and networks reflect current and prospective water resource values.

The other two objectives are to ensure that the market mechanism chosen will be responsive to other industry changes and market experience. Clearly this is important for the medium term, but by the time we get to 2025, the chosen mechanism will have already evolved or accommodated such developments.

Table 1: Reform objectives and importance

Objective	Medium term	Long term
Facilitate right level and type of investment in • New resources • New infrastructure	 ✓✓✓ ✓✓✓	 ✓✓✓ ✓✓✓
Provide appropriate signals for efficient water resource use	✓	✓✓✓
Provide flexible framework that can accommodate a range of industry developments (in particular related to abstraction)	✓✓✓	✓
Evolutionary potential (model can evolve in response to needs of competitive market)	✓✓✓	Not Applicable

3.1.1 Investment in new resources and infrastructure

At present, the approach of water companies to planning investment in both resources and infrastructure largely reflects the scope to use additional resources in their own supply region. Investments in resources elsewhere in the country, using appropriate infrastructure to transport water, are typically little considered if at all. The main exception to this is the Water Resources in the South East (WRSE) group, although few of its modeling recommendations were included in companies' resource plans last time

One reason for this is that there seems to be no effective financial incentive on companies to procure water at least cost. Companies have an incentive to invest in resources and infrastructure in their own region, as these will contribute to RCV growth, on which a profit can be earned into perpetuity. It is better for a company's shareholders for it to invest locally, rather than for it to invest and transport the water.

In the jargon of economics, the regulatory framework is not, therefore, "incentive compatible". Companies do better if they take action that may not be in their customers'

interests. Given the size of the investment plan, even a relatively modest reduction or change to the investment plans may have a dramatic impact on capital expenditure. Taking more account of the value of water in different areas and substituting network (and interconnector) investment could well have significant impacts on trade levels and hence on companies' required investments to the benefit of consumers, particularly in water-short areas.[22]

The most important objective of a reformed market mechanism, particularly for the medium-term, is that it incentivizes the appropriate investment in new resources and infrastructure. This should mean that overall industry investment is lower than it otherwise would have been.

Investments in lower cost resources (with costs including the environmental impact) should therefore expect to receive higher returns than investments in higher cost resources to ensure that the right kind of investment is incentivised. This means that although the investment volume in Resources might be lower, investment value might well be higher, because of higher returns in the longer term.

3.1.2 Appropriate signals for water resource use

An effective water market would ensure that water prices would respond consistently to relative scarcity. Greater water scarcity, current or future, should increase prices with low prices for resources which are abundant. Appropriate water pricing can provide signals throughout the water value chain for the:

- appropriate development of water resources;
- appropriate use of water resources; and
- appropriate use of water by consumers.

In an effective water market we would expect prices to vary by season, reflecting varying availability of water, and by geography, reflecting a limited capacity to transport water and the cost of transport. Prices would therefore signal when limited resources are most valuable, facilitating the most appropriate use of resources in the context of environmental constraints. The resources prices would provide a "price to beat" for upstream entrants.

Prices can also provide signals to consumers to manage their use of water. For example they may be able to store water, reduce consumption at times of scarcity, or install systems to make use of waste water as a resource (and water retailers may provide services to support consumers in this).

[22] The most significant example of the incentive compatibility issue is probably the proposal by Thames Water to construct the Abingdon reservoir, which a formal Inquiry showed that consideration to other more economic options such as trade had not been given.

It takes time, however, for resource providers and consumers to be able to respond to such price signals. *We suggest that in the medium term, providing such price signals is not the most important benefit of market reform.* We would, however, expect that such price signals could progressively facilitate better management of water resources by water companies. Increasing the scope of retail trade to industrial and commercial customers should provide greater responses to water prices and scarcity charges. For households, it makes more sense to wait until metering is more widespread, particularly with low elasticities of demand.

3.1.3 Flexible framework to accommodate a range of industry developments

The water industry in England & Wales is likely to develop in a series of evolutionary steps. These changes will address a range of separate but linked issues, such as:

- *Abstraction*. As discussed below, there are a range of ways in which over-abstraction may be managed. The water market mechanism adopted must be consistent with all the main approaches that might be adopted.

- *Company structure*. At the moment, water companies have effective monopolies within their defined areas of operation. If retail separation occurs, this may change for a part of the value chain, and companies may find other ways to reconfigure their operations.

3.1.4 Evolutionary potential

Water markets have developed elsewhere in the world (e.g. in Australia), but the nature of these markets is different from those that are likely to develop in the UK. In particular, much of the trading that takes place is in water rights, rather than water itself. In addition, the trading is often related to changing demands from agriculture with different underlying determinants of demand than we see in the UK.

There is no blueprint to copy for developing explicit wholesale and retail water markets in the UK – and, given the uncertainties, trying to impose any long-run blueprint now would almost certainly be highly counter-productive. This means that it is most unlikely that any water market design that is implemented for 2015-20 will be in its final form.

We should expect that over time it may become worthwhile to eliminate initial simplifications that were necessary to begin reform implementation. Water companies, and other market participants, are likely to find that they would like particular changes to the market design as they learn about the way that the market operates. Again, we should expect this, and welcome it. Moreover, it is highly desirable that the implemented medium term market design *in itself* creates incentives for further reform to take place, particularly if this happens at the initiative of the market participants.

In our view, there are very strong advantages to a long-run market model that is based on bilateral contracting and that is what we recommend as the best long-term approach. In the medium term, there are reasons why such a model is unrealistic. However, it is possible to envisage a market framework with much more limited change in the medium term, but can accommodate bilateral trades should market participants desire them. This may mean little change if market participants (water customers, incumbent water companies, and potential new third party suppliers) do not find it advantageous. But if the companies perceive that there are strong advantages to such trades, then a move to bilateral trading could happen relatively quickly.

3.2 Constraints

We set out a summary of the constraints to reform in the table below. In the medium term, as we discuss below they are constraints that we think must all be accommodated for any post-2015 model that fits the FPL Framework. In the longer term, though, in the period after 2025, they should not be relevant or if they remain of concern other policy measures could be adopted to manage or mitigate them.

Table 2: Constraints to reform and their importance

Constraint	Medium term	Long term
Consistency with a range of possible abstraction price regimes ▸ Scarcity prices ▸ Shadow prices	✓✓✓ ✓✓✓	Consistency with long term abstraction price model
Consistency with any likely Future Price Limits proposals	✓✓✓	N/A
Maintain the confidence of equity and debt investors, both existing and appropriate new investors (see work on "Guide to reform")	✓✓✓	Confidence in market mechanisms should develop so that specific measures not needed
Provide manageable change for the industry	✓✓✓	N/A
Allow affordability constraints for household customers to be managed	✓✓✓	Can be managed through alternative policy measures

3.2.1 Consistency with a range of abstraction price regimes

Current abstraction legislation is set out in the Water Resources Act 1991 (amended by subsequent legislation including the Water Act 2003). This provides for the current abstraction pricing framework, under which the Environment Agency may only levy charges to recover its administrative costs[23]. Further legislative change is therefore necessary to implement explicit scarcity based abstraction pricing.

An alternative to setting abstraction charges based on scarcity is to limit abstraction rights. There are a range of ways of limiting rights, and for allocating any rights that are granted. Under the Water Act 2003 which amends the 1991 Act, from 15 July 2012 the Environment Agency will have the power to revoke or vary licences without granting compensation where there is serious environmental damage. It is possible that this could provide a basis for limiting abstraction rights, but there are a number of practical and legal obstacles to this which new legislation would overcome.

The Natural Environment White Paper (DEFRA 2011) highlights that a reform of the current abstraction regime is essential to contribute to protecting the environment. Concrete proposals have not yet been prepared, but DEFRA 2011 states that they will be a feature of the future Water White Paper. At this early stage it is not clear how the abstraction regime will develop. Market mechanisms for water, therefore, need to be consistent with a range of possible options.

Abstraction control options are not at the centre of this paper but they do have to be considered to a limited extent. This is partly because they are a key component of resource 'costs'. In addition, we have been specifically asked in this paper to consider how the Resource element of regulated water companies might be priced both with and without explicit scarcity based abstraction prices (or equivalents). Our analysis suggests that most water company structural models are likely to be compatible with *shadow* scarcity prices to be used in future investment appraisals, but that to operate effectively more radically unbundled pool or bilateral trading models are more likely to require *real* (paid) abstraction prices rather than just shadow prices. "Real" (paid) shadow prices would require new primary legislation.

We understand that Ofwat have commissioned other work to focus in more detail on regulatory aspects around abstraction. Hence, we will in this paper focus primarily on the highest level abstraction choices and, even then, only insofar as they affect the choice of market structures and price caps for regulated water companies. We set out below a typology of methods for scarcity based abstraction control:

(a) Scarcity based abstraction (and discharge) prices;

[23] Although an Environment Improvement Charge may be levied locally to recover the costs of particular improvement schemes.

(b) Quantity-based abstraction (and discharge) limits with tough penalties for breaching those limits;

(c) Percentage limits on abstraction, where abstraction licence holders' rights are defined as a *percentage* of declared available water rather than as a quantity of water;

(d) A 'real' paid shadow price of water scarcity incorporated into regulated charged Resource prices; and

(e) A notional (not-paid) shadow price of water scarcity.

Of course, these options are not mutually exclusive and, as noted above, many substantive abstraction proposals combine price and quantity limits, particularly for within-year limits. Nevertheless, it is worth considering them separately, which we do in the Annex

In general, our main conclusion is that scarcity based abstraction prices, Option 1) – if necessary supplemented by seasonal or other quantity limits – is the first-best economic solution for handling prospective water shortages in terms of both economic and environmental efficiency. It is also difficult to see how a developed long-term market-based model taking proper account of water resource availability could operate successfully without explicit scarcity based abstraction prices. However, for the medium-term (e.g. up to 2020 or 2025), we suggest that notional shadow prices might provide a good second-best starting point, particularly for providing effective investment signals for the public water supply sector. They would certainly be a sensible option to explore if explicit scarcity based abstraction prices were ruled out for the foreseeable future and would also fit quite well with our recommended medium-term model.

3.2.2 Consistency with likely FPL proposals

Following the completion of the review of price controls for 2010-15, Ofwat initiated a work programme to review the way it sets prices, with a view to implementing changes for the process for setting prices from 2015 onwards. As discussed in section 2, in April 2011 it published a paper (Ofwat 2011) setting out a broad framework for setting prices, or a "preliminary model". This is not a proposed framework, but rather a possible model to be used as a basis for discussion with stakeholders about the most appropriate way forward.

The preliminary model envisages separate price caps for retail and wholesale activities. The wholesale cap would need to allow revenue recovery both for resources activities, and for the activities encompassed within "Network Plus" (including treatment and water networks). The model also envisages sub-caps of the overall wholesale cap for each of these activities. As part of the paper, Ofwat also signaled that it wished to give security to

investors over the value of the regulatory capital value (RCV) for all investments incurred to date and at least those to be incurred to 2015[24].

The preliminary model will be refined by Ofwat following discussions with companies and other stakeholders prior to a formal consultation ahead of the next price review, but some of the key elements are already clear. Any practical market mechanism needs to be able to be accommodated within the constraints of the likely FPL framework. This is likely to mean:

- consistency with the form of separation of the retail segment;
- consistency with the form of wholesale price controls and associated sub-caps; and
- scope for the framework to allow for revenues to be consistent with the RCV guarantees given.

While revenues associated with Resources will need to be constrained to be consistent with price controls (and particularly with Network Price caps and sub-caps) in the medium term, in the longer term this would not be a constraint. This is consistent with transitional arrangements being imposed to protect companies for the medium term, with market prices determining longer term revenues. We discuss this in more detail in Section 5.7.

3.3.3 Maintain confidence of debt and equity investors

Sustaining a major capital investment programme of over £90bn since privatization is seen as a major success of the existing regulatory framework. Substantial further investment is essential during the current price control period, as well as beyond that in order to meet the variety of challenges facing the industry.

So far, investor confidence has largely been maintained. Water companies have maintained investment grade ratings, despite very high gearing. This means that most debt investors are able to continue to invest in the industry. In addition, the enterprise value of water companies (the value of outstanding equity plus debt) now typically trades at a premium to the regulatory asset value, indicating that equity investors have confidence in the security of the RCV.

Investor confidence is not, however, a given. Investor confidence was severely dented following the tough 1999 determination, and this was a factor in the search for higher equity returns through capital restructuring and securitization. Investor concerns were also raised during the last price control process, in particular with initial proposals. Some high profile fund managers made their discontent clear in the press.

[24] Ofwat said "All assets efficiently incurred up to the end of the current price cap will be protected from stranding by being included in the RCV (that is, the RCV as it stands at 1 April 2015 will not be revisited)." (page 4, Ofwat consultation of April 2011 on FPL preliminary model).

Investors have a choice as to where to invest, and in general they will not have mandates that require them to invest in UK infrastructure or the UK water industry in particular. Investments will only be forthcoming where the returns are appropriate for the associated risk.

Maintaining confidence does not, however, mean maintaining the status quo

- Investors do not welcome changes to regulatory regimes. But nor will they favour no reform in the event that a regime becomes unsustainable;

- Existing investors may have under-estimated the legitimate scope for change; and

- Evolution of the sector may make it attractive to new types of investor, able to exploit and manage new opportunities that could arise from reform.

Clearly reform must recognize the concerns of investors, and the legitimate expectations that they have based on the assurances given under the existing regime. But recognizing these does not mean that the existing regime is frozen.

One particular area of concern for investors is the RCV. In its FPL document, Ofwat indicated that it would ensure that there would be continuing protection for the RCV of investment made to date and planned investment to end March 2015. It suggested that this would be reflected in a continued RCV. We think that this does make sense for the infrastructure part of the business (which accounts for the bulk of assets). But we also think that investors should also be satisfied with a conversion of some of the RCV into a contractual mechanism with the resources business. Indeed, it is worth emphasizing that a contractual mechanism typically has greater guarantees over its security than does an RCV.

3.3.4 Provide manageable change for the industry

There appears to be broad consensus about the need for change. A number of market participants and other industry stakeholders have published on these issues, and an example of these is Water UK (2010). While the need to reform water markets may be accepted, there is, however, considerable debate about the appropriate pace of change.

Introduction of market mechanisms in other industries – most notably energy - has been complex, and costs have been high. There is a danger that the implementation of new processes in the water industry, and the associated costs of new systems that would be necessary to accommodate these would impose a substantial burden on the industry.

An important constraint to reform, therefore, is to ensure that the change can progressively be accommodated by the industry, and where there is substantial change it is clearly related to the fundamental objectives highlighted above.

3.3.5 Allow affordability constraints to be managed

If water prices are progressively to reflect scarcity, with higher prices in those locations where water is scarce, taking account of cash and environmental costs, then wholesale water prices will rise on average and particularly in the most water-scarce areas.

The increases in wholesale prices may be partially or even possibly wholly offset (at least for households) but the more that the price increases were passed though, the greater the incentives for more efficient water use. However, although this would have the strong merit of encouraging appropriate use of water, and investment in resources and infrastructure, it would unquestionably raise affordability concerns about the level of prices, acceptable regional variations in household prices and acceptable rates of change. These issues will have to be addressed explicitly by government and regulators at some point in the future.

Affordability of water services and bad debt (exacerbated by the prohibition on household customer disconnection for non-payment) are continuing concerns. Water prices to households have risen 40% in real terms since privatization, and household budgets are under greater pressure from the economic downturn. These factors have led to an increase in bad debts across the industry of over 50% (Ofwat 2011).

The Walker (2009) review considered social, economic and environmental concerns of water charging for households and made a number of important recommendations. It highlighted the importance of work to establish an economic value of water so that investment decisions are appropriate. It considered that volume-based charging is the most appropriate for water, with a preference for a move to metering for each property. There were also a number of detailed recommendations related to social and discounted tariffs, and other support mechanisms.

Ofwat in its ongoing work programme has published a series of papers on affordability issues. For example, Ofwat (2011) reports summary findings on the types of customer at risk, the types of support available, and future work on these issues.

There is clearly a potential for introduction of market-based mechanisms in the water industry to lead to adverse impacts on at-risk customers, or indeed to make additional customers at risk. For this work, what is important is that proposals allow sufficient flexibility to ensure that there need be no sharp price rises to particular groups of household customers in the medium term which would jeopardize the legitimacy of the charging regime. In the long term, we believe that there need be no such concern, as appropriate alternative protection mechanisms could be developed.

This means that affordability concerns must be borne in mind in *developing* reform, but they should not be a *barrier* to reform.

3.4 Choice of Model

Putting together the discussion of Objectives and Constraints allows us to make our recommendations on the choice of market model both (a) for the long-term.and (b) for the medium-term.

We consider the main models that have been used in energy (particularly in gas) and with variants in other network infrastructure industries. We exclude fully vertically integrated monopoly models and, for the longer-term, focus on market-based unbundled models

Given the above, the models we consider are:

(i) A Pool Model (as in UK electricity 1989-99);

(ii) A Bilateral Trading Model (as in UK, EU and US gas); and

(iii) A "BST" Model (commonly found in energy and a variant of which is used for water in Scotland)

The three models are summarized in Table 3 below.

Table 3: Potential Models for E&W Water Supply Industry

Summary of models		
Pool	**Bilateral**	**BST**
• All resource (and supply) locations make regular offers into administered market • Auction mechanism determines price at which water trades are settled • Contract structure defined by pooling mechanism • Complex architecture of trading mechanism and associate codes	• All trades defined by a contract between a purchaser (retail seller or eligible consumer) and seller (upstream water trading arm) • Structure of contracts defined by needs of market participants not the market mechanism	• Incumbent supplier required to offer water at a "default" administered wholesale price • Parties free to contract bilaterally outside this mechanism • Recommend default tariff set at LRMC based on WRMZ (Water Resource Management Zone) plans or Catchment Zone rankings and embodied in price cap including either paid or notional scarcity elements

The main characteristics, strengths and weaknesses of the three models are shown in Table 4 below.

Table 4: Advantages and Disadvantages of Alternative Water Supply Models

Characteristics of models		
Pool	**Bilateral**	**BST**
• Complex architecture of trading mechanism to handle offers by '000s of locations • In theory strong transparent price signals by location and time... • ...but high degree of market power in zones	• Relatively simple market architecture • Transparency and price disclosure poor • Intensive scrutiny plus possible competition-oriented regulatory intervention may be required to protect against local market dominance	• Benchmark "price to beat" protects non-active market participants • Transparency moderate, but helped by the benchmark price signal

From tables 3 and 4 above, we can assess how the three models compare against our criteria.

Our conclusions are:

(i) The Pool model is unsuitable for water supply and is not recommended for the long-term let alone the medium-term;

(ii) The Bilateral trading model looks best for the long-term but, when judged against the constraints, seems to be neither feasible nor appropriate for the medium-term (i.e. PR14 and PR19);

(iii) The BST model is feasible for the medium-term and has many advantages over the currently vertically integrated monopoly model.

(iv) The BST model also provides a good starting point for establishing a Resources element in water companies that can provide a much better starting point for incorporating scarcity elements, at least for Resource and Network investment decisions.

These conclusions are based on the detailed assessments set out in detail in the tables below. The first of these is an assessment for the *long-term* while the second is for the *medium-term*.

Figure 1. Long term market design: options and assessment

	Pool	Bilateral	BST
Facilitate investment	✓✓✓	✓✓✓	✓✓
Signals for current use	✓✓	✓✓	✓
Flexible framework	×	✓	✓✓✓
Evolutionary potential	××	✓	✓✓(✓?)

Figure 2. Medium term market design options and assessment

	Pool	Bilateral	BST
Consistency with abstraction regime	✓✓✓	✓✓✓	✓✓✓
-scarcity prices	××	×	✓✓
-shadow prices			
Consistency with FPL	×××	✓	✓✓✓
Maintain confidence of investors	××	✓	✓✓
Manageable change	×××	✓	✓✓
Accommodate affordability constraints	××	✓	✓✓✓

Given the appraisal above, our recommendation is that the most appropriate model for PR14 and beyond (e.g. up to 2025) is a BST model. For the long-term, we think that the bilateral trading model is likely to be the best choice.

There are several BST model variants and we discuss these and their pros and cons in the next section. Given sufficient retail competition, we believe that there are strong incentives for the best of these BST models to evolve into a bilateral model not least as a result of the commercial decisions of companies.

4. Medium-Term BST Model Options for 2015 Onwards

In the previous section we discussed possible water supply model options for E&W in the medium and long-term, focusing on upstream trading and related issues including the "value of water". This discussion was conducted in the light of the relevant objectives and constraints which are, of course, much more stringent in the medium term.

We define the medium-term as 2015-25. This is the period outlined in the FPL informal consultation document. Hence, following that document, our medium-term recommendations do not require any further mandatory unbundling of E&W incumbent water companies beyond accounting separation.

Our recommended medium-term model is a "BST" (bulk supply tariff) model[25]. We claim that this provides a way by which both (a) the costs of water resource expansion and (b) resource scarcity costs can be included in the Ofwat regulatory framework. It is not a long-run optimal model, but it does provide a good and practicable starting point; which, given sufficient retail competition, can provide adequate incentives to move towards more ambitious trading models in the longer term.

A brief outline of our proposal was presented in the previous section. In this section, we discuss BST models and options in a lot more detail, including their use in other infrastructure industries and the various model options for E&W water supply.

Our main recommendation is that, if possible, the regulated BST should cover company-wide raw water resource costs, excluding all Network Plus elements, but with an explicit sub-price cap for network prices, the latter within a Network Plus price cap. The raw water resource costs should be established and published as a (regulated) Resource price cap. This price cap which can then operate as a transparent marker price for upstream competition both from other incumbent water companies and from new entrants. We also recommend that at least scarcity-based abstraction costs are incorporated via shadow scarcity prices focused on new investments.

The reasoning for these recommendations is set out in what follows.

4.1 Bulk Supply Tariffs in Other Infrastructure Industries and in Scottish Water

Bulk supply tariffs (BSTs) are common and of long-standing in electricity and gas. For this paper the relevant question is whether and under what conditions they establish a robust and economically justifiable value for the upstream "production" element (i.e. for

[25] Strictly speaking, it should be a "BSP" or bulk supply price model but the term BST is well-known unlike BSP.

power generation and for gas injected into the network – the energy equivalents of the resource costs of raw water)[26].

4.1.1 BSTs in Electricity and Gas

Energy BSTs usually operate as a maximum *wholesale* tariff which typically includes network costs – but they do not have to operate in this way. A classic bundled generation and network tariff is the pre-privatization E&W BST which operated in the period up to 1989. Under this arrangement, the CEGB sold electricity to the Area Boards at a regulated price that covered both generation and transmission. The Area Boards then sold the electricity to all final customers with a mark-up to cover low voltage distribution costs and a retail sales margin.

BST's are most often set to be uniform over a national jurisdiction but there is no reason why they cannot be made regional. In the US, each State will have its own electricity BST unless it has introduced wholesale competition. BSTs can also readily be given time-of-year or time-of-day variations to take account of differences between peak and off-peak demand.

BSTs are often used as a starting point for further unbundling. For E&W electricity, the pre-1989 BST and the merit order dispatch routine that underpinned the generation part was a key foundation for establishing the generation price trading arrangements in the post-privatization electricity wholesale market (the Pool)[27]. In addition, transitional pricing arrangements were established for coal-powered generation which operated along BST lines.

Electricity privatization was accompanied by a 10-year pre-announced programme for the introduction of retail competition. This was introduced for large industrial customers in 1989, extended to medium-size industrial and commercial customers in 1994 and to all remaining customers (including households) in 1998. The evolutionary unbundling of the BST into a traded generation price and a separate regulated transmission price operated by a separate National Grid was a key element in this transition[28].

The path to full retail competition in gas in the UK followed a not dissimilar path, but lagged because gas was originally privatized as a vertically integrated monopoly. Only after 1990 were regulated transport prices established and separated from upstream gas prices. This was followed by the mandatory introduction of wholesale competition plus retail competition in the industrial market. In the latter case, suppliers competing with British Gas were given considerable assistance by Ofgas and the MMC in establishing viable commercial entry into industrial gas markets.

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[26] The energy policy equivalent of scarcity abstraction charges would be carbon taxes or emission permits. However, these do not present the same problems as for water supply since the externalities in question are global rather than local or regional as in water.

[27] The Pool was designed from the starting point of the dispatch optimisation routines operated by the CEGB before privatisation, using a System Marginal Price (SMP).

[28] See Littlechild (2010) for a history of this path. This paper clearly brings out the role of the BST as a starting point for the initial vesting contracts.

Other countries have also used a BST as a way of beginning commercial unbundling of vertically integrated industries. Many middle income countries used a BST with network costs as a first step but, particularly in Latin America, a major reform step was to establish regulated average generation prices with separate network charges.

Although BSTs which include network costs can support the development of retail competition, particularly for non-household customers, in practice there are many problems. They are typically very open to strategic anti-competitive behaviour by incumbents. They may give marker prices for electricity or gas upstream competitors – but the incumbents still have control over network access and management which can readily prevent any substantive development of upstream trading – at least in the absence of regular and, if necessary, intrusive regulatory and competition policy intervention. The pro-competition intervention required to establish viable and robust wholesale and retail markets has consistently been shown to be significantly greater for both gas and electricity where network and service costs are bundled together than when they are separated[29].

The potential risks for combining an upstream resource cost with network costs is well-demonstrated by the 1983-89 E&W electricity experience. The 1983 Energy Act required Area Boards to buy electricity at prices at or below Private Purchase Tariffs. The latter were based on the BST. This required the CEGB and the Area Boards to open their networks to private purchasers. Of course, at that time, without retail competition even for large customers, Area Boards were the sole purchasers for the new power producers. The Act was a failure with virtually no private generation supply entry. The similar 1982 Oil and Gas (Enterprise Act) was also a failure with no competing gas flowing through BG's network until 1990.

A major reason for the electricity failure was that the CEGB was allowed to restructure its network costs in ways that adversely affected new entrants and it also consistently caused problems over transmission access. In addition, the CEGB was allowed to offer selective discounts on its bulk power sales, which provided very effective entry deterrence. The 1980s electricity privatization with network separation was, to a considerable extent a response to the fiasco of the 1983 Energy Act. (Similar problems arose with UK gas in the 1980s, where separate and regulated gas network prices had to wait until BG's 1992 undertakings to the Office of Fair Trading[30]).

Similar issues to those above are common in EU and US energy markets and are widely documented e.g. in the 2005-7 DG (Competition) Energy Enquiries. Several of the papers commissioned by Ofwat on System Operators addressed these issues, including a detailed survey reported in Stern (2011).

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29 See, for instance, Stern (2011).

30 See Vickers and Yarrow (1988) and Armstrong, Cowan and Vickers (1994) for detailed analytic narratives.

In general, the experience in electricity and gas markets is that the following are needed if BSTs are to promote rather than inhibit upstream competition , including setting a value for power generation or landed gas:

(i) *Separation of network access and prices from upstream production*. This implies regulated TPA and network access prices and not negotiated TPA (tried unsuccessfully in Germany).

(ii) *Enough retail competition to provide a real threat to incumbents' market shares from final consumers, preferably by well-informed final consumers*. This means that the intensity and effectiveness of competition is critical (e.g. the number of players on both sides of market) as well as the degree of legal openness.

(iii) *Sufficient likely or early potential entry from other upstream producers*. Active intervention from the regulator and/or competition agencies may still be required to force incumbent to relinquish control of either upstream supplies and/or very high shares of retail markets (viz. British Gas, EU virtual capacity auctions).

4.1.2 The Scottish Water BST

It is worth noting that Scottish Water has a wholesale price cap that provides a nationally uniform wholesale price. This regulated wholesale price includes all water pipe, treatment and other upstream costs (i.e. all the costs that Ofwat has suggested be allocated to Network Plus). It remains to be seen whether (a) the new water retailers remain active in the market and (b) whether WICS will feel the need to take further action on network access and pricing and/or upstream competition for the retail market to continue delivering improvements to customers.

There is an obligation on Scottish Water to offer network access to alternative upstream suppliers should they come forward but, as yet this has not been activated. In addition, WICS has the power (a) to set network prices and (b) to intervene in upstream and retail markets should evidence come to light of anti-competitive behaviour by Scottish Water. However, neither of these sets of powers has yet been tested.

The existence of retail competition – or at least contestability – is a reason why the Scottish Water experience may be better than EU and UK 1980s energy experience with a bundled BST. However, clearly there remain serious potential risks of within-incumbent collusion (e.g. on information exchanges) as well as the potential for playing strategic games via network access. The risk of these may be small while Business Stream (the legally separated Scottish Water retail arm) retains the overwhelming majority of eligible customers and effective market dominance. Nevertheless, EU and UK energy experience suggests that this could well change significantly if Scottish Water were to find its retail market share falling substantially threatening some upstream asset

under-use or even stranding. This might, however be changed were Business Stream to act strongly – and *allowed* to act strongly by its parent company - to preserve its commercial position regarding business customers by developing links to alternative upstream suppliers (actual and/or potential.).

In spite of the cautionary comments above, a fully bundled network and service price cap on the lines of Scottish Water is one of the three BST options for E&W water supply that we consider later in this section.

4.2 Alternative BST Resource Models for the England and Wales Water Supply Industry

We are proposing a water resource BST as the best available means to value water and enable a Resources price cap in the medium run. Following the discussion in the Section 3, we argue that, when combined with retail competition, a water supply BST provides strong incentives for companies to develop upstream competition and bulk water trading and, hence, to transition to bilateral water trading in the longer run. In the absence of sufficient and effective retail competition, the model is at least acceptable and coherent enough to act as a potential long-run model. We discuss this later in the context of potential water supply arrangements in Wales post-2015.

We cover later in some detail as to whether the Resources price cap should include or exclude water supply network prices. The differences between our three proposed options focus on this issue.

4.2.1 Alternative Models for a Water Supply BST

We consider three models. They are set out below. The first two contain a *raw* water BST as set out above. The third operates as a *treated* water BST. The differences between the three options are whether any network elements are added to the water costs and, if so, how many. This raises the issue discussed at the start of this section as to whether or not it is possible to set separate price caps, firstly, between Resources and Network Plus; and, secondly, within Network Plus with a separate price sub-cap for pipe networks within Network Plus.

In what follows, we assume that the "network" includes all within-company pipes both raw water transport pipes (primarily pipes from water source to treatment works) and treated water transport and distribution pipes. It is possible to include the former in Resources but we would strongly argue against that option.

We consider the following 3 models.

Model 1 A BST for *raw* water excluding all Network Plus prices and with an explicit sub-cap within an overall Network Plus price-cap to regulate

prices for within zone (e.g. company level) raw and treated water pipe networks.

This is a model based on energy sector experience

Model 2 A BST for *raw* water excluding all Network Plus prices but with a separate single Network Plus price limit and without any sub-cap for network prices.

This is a model derived from the FPL Informal Consultation Document

Model 3 BST for *treated* water which combines in one (wholesale treated water) price cap all the wholesale trade, network and other elements upstream of retail supply

.

This is the current Scottish Water model

The April 2011 FPL informal consultation referred to regulated access fees for treatment works as well as to regulated transport network prices. This might be possible in our Options 1 and 2. An alternative, advocated in Stern (2010), would be to designate current treatment works as "essential facilities" under competition law. The latter would allow the development of new market mechanisms for treatment works and the development of "merchant" treatment facilities as well as new entry. In general, as with gas storage, access to treatment works could in this way be made subject to negotiation, with safeguards against anti-competitive abuses[31].

For each model, we assume that there are scarcity-based prices – probably shadow prices - which are included in the companies' price capped Resource BST as discussed in the previous section.

The differences between the models are all in the degree to which network, treatment and other elements are separated. This is shown in the diagram below

[31] In the longer term, beyond PR14, it might be possible to separate treatment and its regulatory oversight more fully within Network Plus. This would allow a BST for treated water which allows network separation as in Option 1. However, this option needs more thought and is not recommended for the medium-term.

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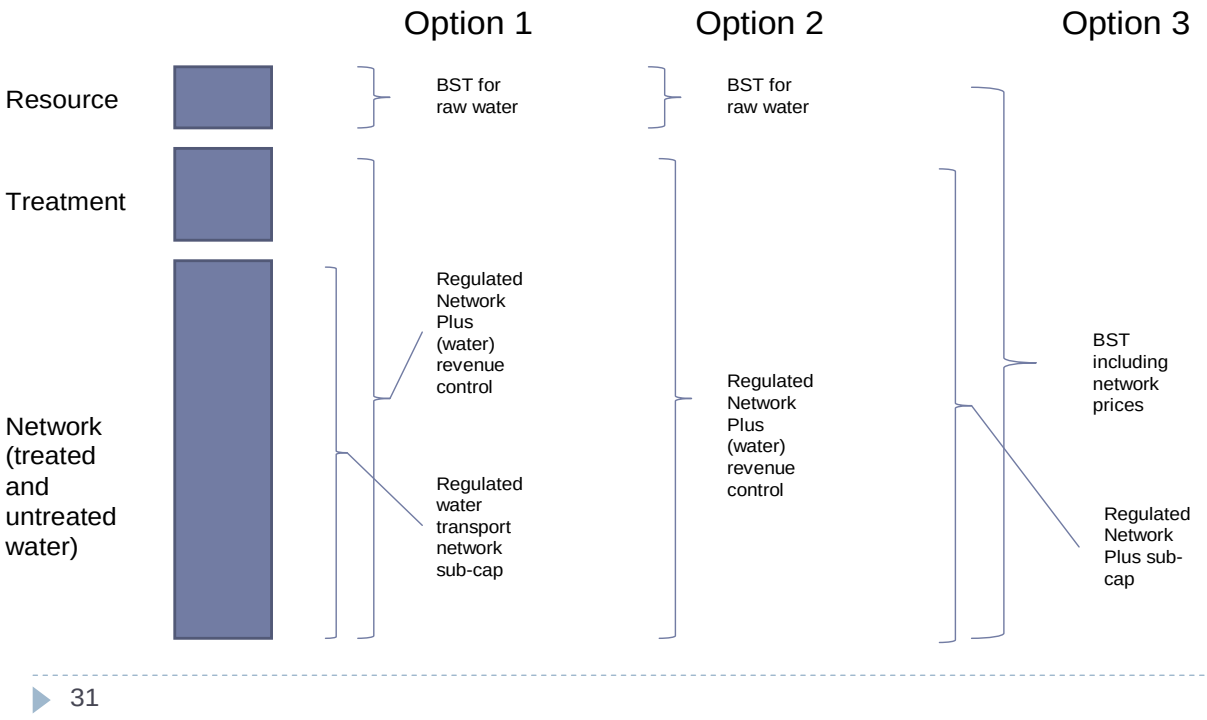


The Advantages and Disadvantages of each model are set out in Table 5 below.

Table 5: Advantages and Disadvantages of Alternative BST Models

	Model 1	Model 2	Model 3
Advantages	• **Transparency.** There is a clear marker price for all bulk water purchasers and for competing sellers. • **Much more straightforward to regulate** – Ofwat has a clear division and allocation of costs between water resources and network pipeline prices. • **Clear obligations on incumbent water companies concerning network access.** They have to provide a set of defined network services, including specified access rules and prices, against which they can be held to account. • **Strong incentives for development of upstream trade where justified on cost grounds.** It is much harder for companies to maintain continued use of real and/or perceived network constraint arguments as impediments to competition. • **Most likely model to foster development of economic interconnection between companies.** • **Model with strongest internal incentives for evolution to bilateral trading model in long-run, provided that there is sufficiently strong retail competition.** This is achieved without mandatory unbundling beyond accounting separation in PR14. • **Competition monitoring and enforcement much more effective.**	• **Transparency.** There is a clear marker price for all bulk water purchasers and for competing sellers. • **The water resource element is separated from Network Plus and all its components.** • **No need to develop company level network prices by 2015.** • **Moderate internal incentives for evolution to bilateral trading model in long-run, provided sufficiently strong retail competition.**	• **The simplest model – does not require development of explicit network prices.** • **Tried and tested - follows Scottish Water model and many gas and electricity first steps.**
Disadvantages	• **For PR14, there will need to be some starting network pipeline access prices.**	• **Pricing transparency seriously compromised regarding water transport relative to treatment and other Network Plus costs.** • **Much harder to hold incumbent companies to account regarding timely non-discriminatory provision of defined network services.** This includes pipelines, treatment works, etc. • **Much easier for companies to continue using real and/or perceived network constraint arguments as impediments to upstream competition.** • **Relatively unlikely to foster development of economic interconnection between companies.** • **Competition monitoring and enforcement likely to be much less effective than in Model 1.**	• **Highly opaque – very difficult (a) to regulate or (b) for upstream or retail competitors to develop a new business over which they have genuine control.** • **Can be extremely difficult to develop well-functioning new markets.** Competition oversight tends to lag badly and is typically ineffective without further unbundling. • **Model with the weakest internal incentives for evolution to bilateral trading model in long-run.** Requires strong regulatory and/or competitive intervention to move in that direction even with relatively strong retail competition. • **Very difficult to set a single price cap for combined wholesale price of treated water that is fair to (a) customers (b) competitor companies and (c) incumbents.**

From Table 5 above, we derive our third main recommendation.

Our third main recommendation is that, if possible, Model 1, should be adopted. This model sets a regulated price for Raw water, which includes some scarcity considerations but which, firstly excludes all Network Plus elements; and, secondly, separates pipe network access and pricing from all other network elements via a pipeline sub-cap within a Network Plus price-cap.

The main reason for recommending this model is that, provided there is sufficiently strong retail competition for non-household customers, it provides the strongest internal economic incentives for developing effective upstream markets and trading – including towards bilateral trading.

One particular issue with Option 1 is that around 25% of water in England & Wales is sourced from boreholes. This water requires much less treatment than river-abstracted water, so there is much less distinction between raw and treated water. Our proposed model treats borehole water as raw, and hence arguably undervalues it. This might distort some investment decisions, but we suggest that there are ways by which this can readily be mitigated, for instance through lower treatment costs for borehole water or (if necessary) by transport network access price design. This is an issue worth noting but it is by no means insoluble.

The main argument against Model 1 is that it would require the establishment of applicable network access rules and prices by 2015. Some people claim that this is not possible. We disagree and set out our proposals and reasoning in Section 5 below.

4.3 A BST Model with No Expansion of Retail Competition – Wales

The question arises with our recommendations as to whether our proposed BST model would work were retail competition in England and Wales to be restricted to its current level, rather than increased as proposed by the Cave Review. Our answer is Yes, but most of the longer term incentive effects would be heavily muted.

In particular, we would expect that the incentives towards a long-run bilateral competition model would effectively disappear. It is the *combination* of our recommended BST model and extensive retail competition that creates the longer run incentives. However, were retail competition not to be extended either in England or Wales, this methodology could still be used to set a water resource BST price cap for England and Wales.

However, the question is practical as well as theoretical. So far, the Welsh Government has consistently opposed the extension of retail competition. So, the question arises as to whether and how well our proposed model would work in Wales, assuming that the Welsh Government policy on retail competition remain unchanged.

We believe that, in the event that retail competition is not extended in Wales, price control architecture using BST can – and should – be applied. Model 1 (water only) BST would be our preferred model for Wales in those circumstances as well as for England and Wales with retail competition.

Even without further retail competition it would signal an effective value of water, and providing improved investment incentives, not least on service-network trade-offs and within company interconnection. It would also simplify regulation as, if the BST Model 1 were applied in England, the same regulatory methodology would be applied across all water companies.

Perhaps more importantly, owners of water resources in Wales (Glas Cymru and possibly others) may well wish to sell water to English customers. However, compatible – preferably the same - access / interconnection arrangements implemented are needed in both Wales and England to achieve this. In addition, were Welsh policy to change to greater sympathy for retail competition, our recommended BST Model would best allow Welsh water producers and consumers to reap the benefits assuming that it had been adopted in England.

4.4 Conclusions on the BST Model

Summarising this section, we can say that a BST with separate network price sub-cap within Network Plus (BST Model 1) is clearly our recommended way forward in medium term and for PR14. The key points are:

- It provides good investment incentives that can incorporate major or minor abstraction charge reforms;
- It identifies major water company business activities and trading opportunities without large-scale early unbundling of existing incumbents while providing a clear "price to beat" for upstream competitors;
- It can readily evolve into a bilateral trading model, given significant levels of retail competition in the business and commercial retail markets – and has strong incentives to do so; and
- Examples exist of successful use of this type of model in energy – including temporary declining transitional payments.

Problems remain including interconnection, water network access charges, security of supply, but these exist in all market oriented models and are almost certainly less serious in BST model than in more ambitious models. The proposed model may not be optimal but it is a 2nd-3rd best and much better than a 10th best. Hence, even without a significant expansion of retail competition, we would argue that the recommended model would significantly improve regulatory transparency and coherence.

Finally, we note that none of the main problems identified seems impossible to solve for PR14 implementation

5. Key Design Issues for Medium Term BST Model

In this section, we cover a variety of issues raised by our BST proposal in more detail. These include how the BST might best be constructed, how many BSTs might be needed, network issues including a network price sub-cap and how it might be constructed, interconnection between companies, the treatment of water losses, how abstraction choices mesh with model choice issues and transitional issues.

We discuss each of these in turn.

5.1 Construction of the BST

One of the most important issues in the design of the BST is how it should be constructed. The BST represents the default tariff which customers pay in the absence of contracting independently. It also represents the revenue that an investor in new resources to supply large parts of the market would receive.

We suggest that, as a starting point, it needs to reflect the LRMC of new supplies. This means that it reflects what we could reasonably expect prices to be in an effective market. In water stressed areas, a water scarcity component should be added to this LRMC-based price.

5.1.1 The LRMC Element

For each WRMZ, the LRMC of water is the cash LRMC of different resource sources (including transfers from other companies and from other WRMZs from the same company) plus a scarcity charge. The cash LRMC is the cost of the highest cost resource (capital and operating costs combined) that is expected to be used to meet demand. The scarcity charge applies for those zones where water is over-abstracted or over-licenced, which in turn will typically mean higher BST levels in WRMZs which are in water deficit.

The BST is calculated as the average of the LRMC for each of the WRMZs contained in the trading zone (which we assume to be company-wide – see below).

Figure 3. Constructing the BST: LRMC in each WRMZ

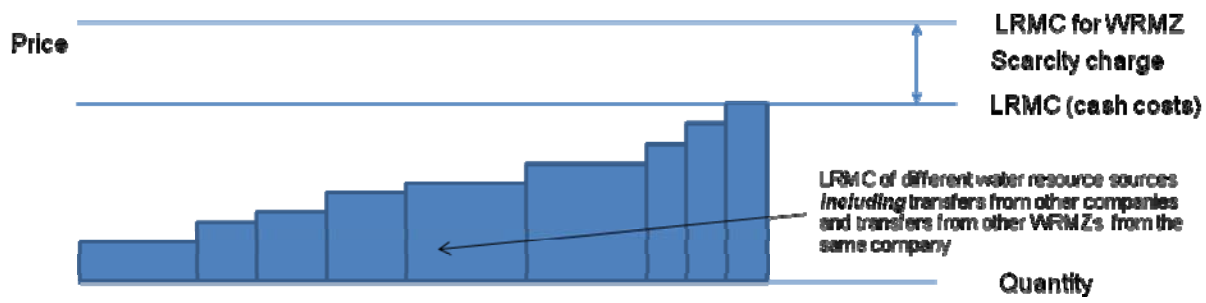
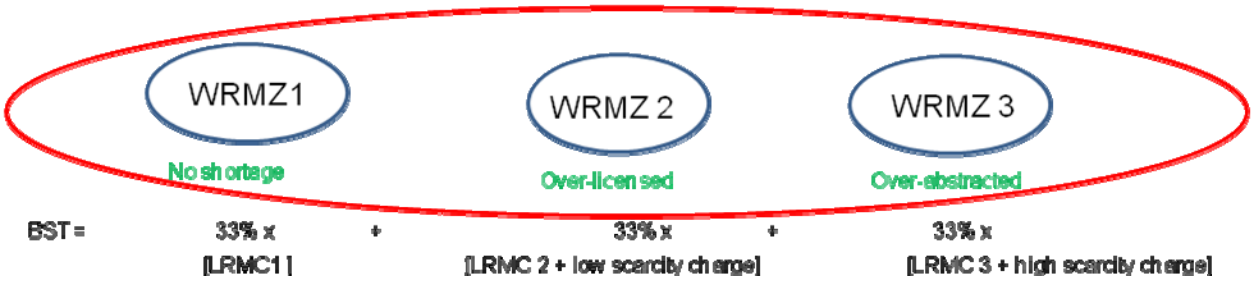


Figure 4. Constructing the BST for a Company



5.1.2 Water Scarcity Charges and the LRMC

The diagram above refers to water scarcity charges for abstracted water. However, in this context, the key issue is whether we use:

(a) real (paid) abstraction prices; *or*

(b) shadow abstraction prices..

The latter can only be used for water investment appraisal purposes, the former can be used for both appraisal purposes and efficiency in current use. As shown in the diagram above, the construction of LRMCs needs to reflect relative water scarcities. *Whether scarcity based abstraction charges are shadow prices or real prices, the investment appraisals carried out in WRMPs and reported to Ofwat and EA should incorporate those scarcity based abstraction charge prices.* The catchment zones, reflected on EA mapping as CAMS areas, appear to be readily aggregatable to correspond to LRMZ (local resource management zones) and WRMZ areas.

However, even with shadow abstraction prices, it would still be necessary for EA to provide estimates of the appropriate shadow abstraction charges (a) by catchment zone and (b) for 25 or more years into the future. Of course, both the degree of geographical disaggregation and the temporal path can be greatly restricted, particularly in the medium term. We could, as the Cave Report suggested, start with just two levels of scarcity charge – e.g moderate for over licensed catchment zones and high(ish) for over-abstracted catchment zones. Similarly, the time path could be kept to (say) 5 year averages for the initial 10 years and 10 year averages thereafter.

In view of the legal and other impediments for real scarcity based abstraction prices, we recommend starting with shadow abstraction prices incorporated into estimates of the LRMC of new supplies.

However, there are also disadvantages with this option. See Text Box below.

Text Box 1

Shadow Scarcity Based Abstraction Prices as a 2nd Best Solution

Shadow pricing of abstraction raises various problems, the main ones of which are listed below. These include:

(i) Incumbent water companies would have the incentive to optimize between resource investment and other (e.g. network and interconnector) investment at the margin but the impact on infra-marginal investments would be rather less than with equivalent real scarcity based abstraction charges.

(ii) It is unclear how seriously regulated water companies would take investment appraisals with shadow abstraction prices if no revenues were involved. However, that might change were the shadow prices taken as precursors for real shadow prices to follow on in a few years time. In that case, not taking them seriously might lead companies to have the wrong resource-network asset balance in place once real abstraction prices were introduced at a significant level.

(iii) Upstream water trade between regulated incumbent water companies would be on level terms but new entrants would not face the shadow scarcity charges unlike with real charges. This is a disadvantage but not a major one – and may, if absolutely necessary, perhaps be offset by Ofwat or EA conditions on the abstraction and/or sales of licenses.

However, these problems look relatively small and a major improvement on the current position where abstraction charges are neutral or perverse relative to water scarcity. They may not be 1st best but they make a very promising 2nd best solution which may well be more practicable in the medium term. Moreover, should these and other problems arise with shadow abstraction prices that would help encourage pressures for an earlier move towards real abstraction prices.

(We note that LRMC-based pricing for the BST, particularly with "real" shadow prices, may lead to the under-or over-collection of revenues. Measures to handle this are discussed in Section 5.7 below).

5.2 Trading zones

The availability of water varies by location and the capacity to transport water is limited. As a result, the value of water varies significantly by location, and those variations are currently projected to increase.

An appropriate market mechanism for water needs to reflect this. There are, however, regions within which the value of water may be considered to be the same. We term such a region a "trading zone". Within a trading zone:

- all customers are offered water at the same wholesale water price (i.e. the BST would be the same across the trading zone); and
- customers would be able to contract with resource providers from within the region without paying any extra water transport charges (i.e. no additional charges on top of a base network access charge).

There are a range of options for the size of trading zones:

- single trading zone for England & Wales;
- regional trading zones, each potentially encompassing the operating areas of more than one company;
- trading zones which are the same as company operating areas;
- trading zones matching Water Resource Management Zones (WRMZs); or
- catchment area trading zones.

What is the right size for a trading zone? Smaller trading zones have the attraction that they would send more accurate price signals reflecting local constraints and water availability. But there are considerable disadvantages: there would be significant transaction costs associated with establishing small trading zones, the associated process and systems to accommodate them; and resource providers within each trading zone would have considerable market power.

Larger trading zones are better:

(a) if there is more network infrastructure;

(b) if the difference between marginal resources costs in different locations is low; and

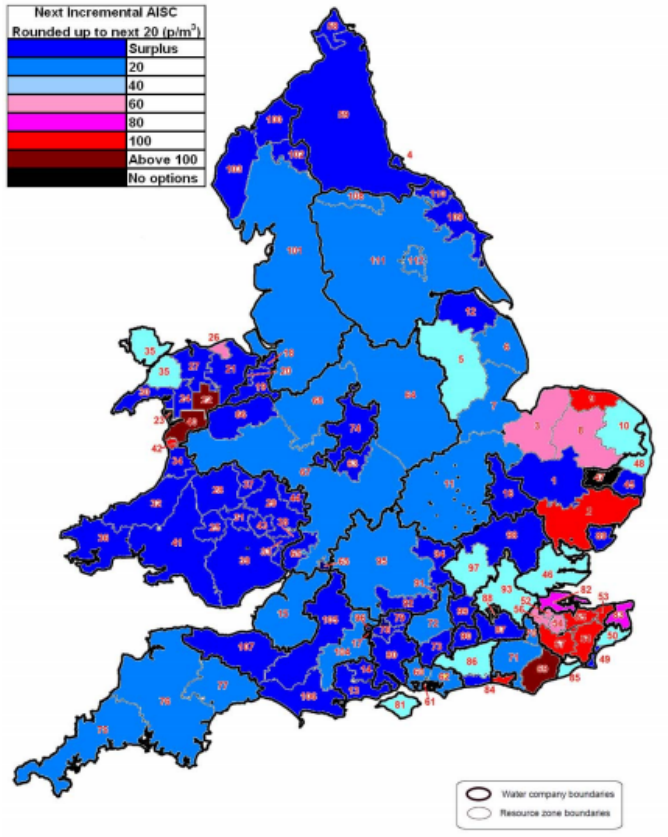
(c) market concentration is high. Larger trading zones are likely to facilitate competition more effectively.

We recommend that the most pragmatic approach is, in the first instance, to use water companies' appointed service areas as the trading zones (with some possible exceptions where these areas are small). The reasons for this are:

- It provides scope for sufficient regional differences in prices to be meaningful
- It avoids the complexity of negotiating price of access between trading zones within a company region
- Companies would be incentivized to construct infrastructure to facilitate water transport within their own regions should price differentials support this.

The relevant factors are summarized in the map shown in Figure 5 below.

Figure 5. Variation in LRMC for WRMZs



Source: Ofwat calculations based on draft WRMPs

5.3 Within company area network access charges

All users of the networks (resource providers and consumers) will need to pay access charges to make use of the networks. In return for the network access fee, the consumer or resource provider would have the right to buy or sell respectively water within the trading zone for no additional charge.

For our recommended model with a separate network price sub-cap, the level of the network access charge for consumers would be independent of whether they are buying through the BST or on a bilateral contract.

There are two key questions in designing network access charges:

- The overall level of the charges; and
- The structure of the charges.

The level of charges will be determined by the modern regulatory techniques used in infrastructure industries. Our main recommendation here is that there should be an explicit network sub-price cap within Network Plus so that there is a separate price control for the pipes, and a residual (implicit) price cap for the other water infrastructure facilities such as treatment, and other network services.

For the structure of charges our recommendation is that Ofwat can and should require companies to charge simple cost based "postage stamp" network tariffs on intra-company networks for PR14.

5.3.1 The overall level of charges

The level of the charges will be determined by the Future Price Limits project. Network fees would be designed to expect to recover this revenue.

The general principle is that the number of sub-caps should be one less than the number of separately regulated elements in Network Plus. Hence, if Network Plus were divided into three separate elements, there would be a Network Plus (overall) price cap and two sub-caps. That gives an implicit sub-cap on the 3rd element[32].

For the purposes of this paper, we recommend that there should be *two* regulated elements:

(i) within company (pipe) networks; and

(ii) the rest of Network Plus (i.e. treatment works, system operation, etc.)

Hence, it follows that this would require a Network Plus overall price cap and a separate sub-cap for network prices.

[32] The expected revenue for the 3rd element is the expected revenue for Network Plus given the overall price cap *minus* (the expected revenue from the first element given its price cap + the expected revenue from the second element given its price cap). This provides a "collar" on revenues for elements not explicitly included in price sub-caps.

Note that we recommend including system operation within Network Plus and not in Resources. (Of the papers on system operation commissioned by Ofwat, those by Bolt, Harris and Stern all suggested that system operation functions clearly linked with networks. In addition, all six of the bullet points on Ofwat's web page on the system operator consultation contain the word "network".)

At some point in the future, it may be advisable or necessary to introduce additional price sub-caps within Network Plus or to deregulate some elements but that can be left for the future. There may, however, be a need for additional competition monitoring and enforcement for some elements within the residual part of Network Plus e.g. essential facility rules or anti-discrimination clauses on treatment works and other facilities.

5.3.2 The structure of charges

The structure of charges is more complex. There are differential costs to serving customers in different locations, and charges, and expectations of future charges, can change the behavior of customers (both producers and consumers).

Water networks are much more like electricity and gas networks than telecom networks. That points to regulated network (water pipe) access prices rather than negotiated prices – at least for within intra-company pipes. There may be scope for a more negotiation-led network price regime for inter-company pipes, with Ofwat laying down guidelines and arbitrating in the case of an absence of agreement but this does not apply to intra-company networks.

Economically efficient pricing for transmission and distribution networks requires a design that:

(i) encourages the efficient use of the network;

(ii) encourages the efficient location of new upstream works and customer location decisions; and

(iii) encourages investment in the existing network and network expansion.

In addition, the pricing system should be (a) transparent, (b) non-discriminatory and (c) recover all network operating and investment costs[33].

[33] The Water Industry Act 1991 as amended also contains reference to access prices. Section 66E sets out some provisions concerning access charges known as the "Costs Principle". This provides restrictions on access prices, related both to costs associated with the water supply, and estimated avoidable costs. It is not straightforward to summarise the condition, and its interpretation is subject to much debate and controversy. Moreover, it is debatable whether the legislation is consistent with other aspects of competition law (including the case law on margin squeeze). We note that this provision of the law is framed in such a way that there is a presumption that most customers are supplied by the licensed undertaker, with the access fees determined by exception.

There are a wide range of options for the design of charges:

- **A "postage stamp" charge**, under which all customers pay the same charge per unit (either capacity or volume).

- **A long run marginal cost approach**. Within this approach there are many variants, but the aim is to signal to consumers the long run cost of network expansion to accommodate their desired contracts.

- **A short run marginal cost approach**. Under this, users would pay (or receive) the short run marginal cost of an additional unit of water.

Within these broad methods, there are further detailed questions concerning how much geographic averaging of charges is done, and how much differentiation by season / time of day.

We recommend that in the first instance, a postage stamp charge is adopted.

The reasons for this are:

(i) It is simple. The data needed to implement such an approach should be readily available, essentially being the total costs to be recovered from customers connected to the relevant part of the network, and the expected volume

(ii) It is easily understood. There is no "black box" needed to calculate charges.

(iii) The distortions to behavior are likely to be small in the first instance.

(iv) If it proves to be unsatisfactory, it is straightforward to amend it later on the basis of additional analysis.

(v) Doing anything more complex could provide an unnecessary barrier to implementing market reform early.

Postage stamp charges are, of course, far from state-of-the-art but they can readily be developed to include distance factors and other elements. Given the current state of

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Where access prices for new entrants and the incumbent are set in a non-discriminatory fashion, as required for a wider development of competition, it is not clear how this provision could apply.

For the purposes of this paper, we assume that this principle would not impose any unwarranted restrictions on access prices. However, we also recognize that this is a well-recognised ambiguity. Whether or not Section 66E would, as drafted, would in practice (and if tested in court) impose any unwarranted restrictions on access prices is very unclear, although, as we and other commentators suggest, it may well be able to do so. Nevertheless, it is generally accepted that Section 66E should be recast as a priority in any new Water Act,. That would clearly and unambiguously allow access prices to be developed as recommended in this paper but with full legal backing.

development of the England and Wales water supply industry, it is difficult to imagine that full-blown nodal prices would be required although at some point in the future, it may be sensible to add distance factors and/or other components – but, that is for the future: it does not need to be done now.

There is precedence for such an approach. On vesting, National Grid put in place a set of simple transmission network access charges. It then conducted a review to consider the appropriate method in the light of detailed analysis and consideration. New charges were implemented on 1 April 2004, using a long run incremental cost approach.

We argue strongly that implementation of network prices is feasible for 2014. Furthermore there is no reason why the current absence of network prices should be a show-stopper that would prevent the implementation of BST Option 1 in PR14. To avoid any potential distortions, we recommend that a reconsideration/appeals procedure is included (or alternatively a mid-Period review with a re-opener facility).

5.4 Interconnection between companies

A sale of water from a resource business in one trading zone to a customer in another trading zone would require the purchase of interconnect services. These interconnect services can be provided in a number of ways including:

- Access to existing interconnectors;
- Expansion of existing interconnection;
- Building a new interconnector;
- Offset existing flow in opposite direction; and
- Supplying water from elsewhere to the buyer (so the buyer gets the effect of interconnection without water actually being transported).

There are a number of important issues concerning interconnection related to the basis of charges, terms and conditions, and ownership.

In all network industries these issues are complex. There are dangers about being too prescriptive in such an early stage of market reform: restrictions imposed in advance may inhibit the economic development of appropriate interconnection infrastructure. We suggest that network companies should be obliged to offer interconnect services, but that in the first instance, the terms and prices of interconnection may be left to inter-company negotiation, with a right of appeal to either Ofwat or the Competition Commission.

However, negotiations are most likely to evolve to a successful conclusion if Ofwat issues model contracts in advance. It should also provide guidance on what type of terms, conditions, and prices it would be likely to approve or reject on appeal.

- Examples of the type of terms that Ofwat may consider is that for long term contracts, Ofwat would be unlikely to approve a price for interconnection that exceeds LRMC;

- It would be harder to set detailed guidance for shorter term contracts, but Ofwat would need to monitor for any evidence of market abuse;

- Certain terms and conditions would need to be standard. This would include "use it or lose it" (UIOLI) clauses; and

- To avoid concerns about market abuse, secondary markets for the exchange of interconnect capacity would be strongly encouraged.

5.5 Losses

In 2009/10, total leakage was 22.5% of total water input into the system (leakage was 3,281Ml/d, compared to 14,594Ml/d water input, see Ofwat 2011). So leakage losses are material, and more than twice typical overall transmission and distribution losses in energy for example.

Leakage losses need to be accounted for in the BST and contract framework. Resource providers need on average to input 22.5% more water onto the system than consumers demand. There are two main ways in which losses can be handled:

- *Option 1. Retail scaling up.*

  Under this option, the retailer would be required to contract with resource providers for the water demand from customers scaled up by the appropriate loss factor. So if the customer demands 100Ml, and losses are 22.5%, the retailer needs to buy 130Ml from the resource provider. [34]

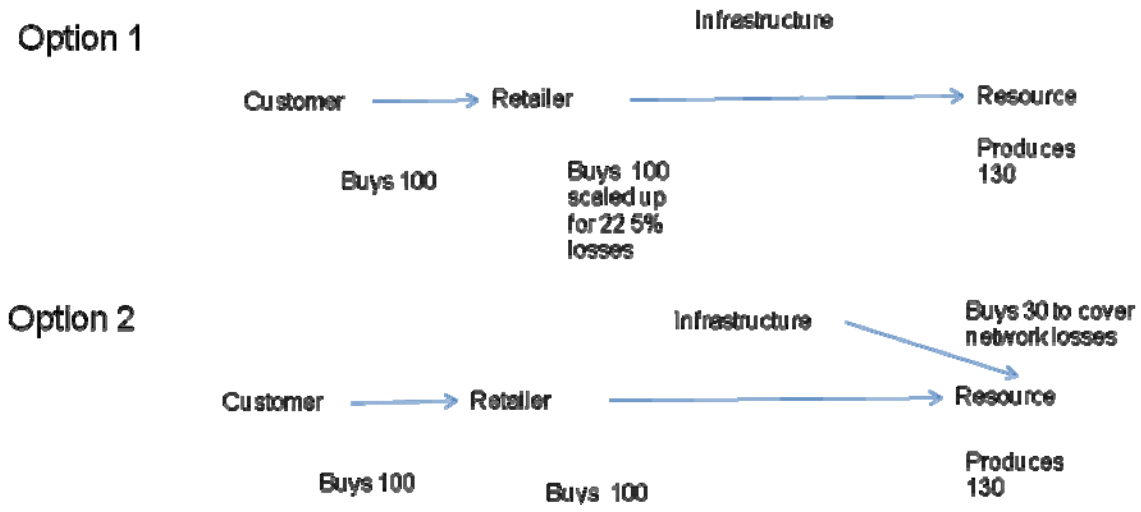
- *Option 2. Infrastructure company buys losses*.

  Under this option, the retailer contracts for the level of water demand. It will pay access fees which includes the expected cost of losses. The infrastructure company responsible for delivering water will pay actual losses, thereby having a direct incentive to manage the cost of losses, trading off the cost of reducing leakage against the cost of paying for lost water. Under this option, a customer

[34] 100Ml x 1/(1- % losses), or 100Ml x 1/(1-0.225) which is 130Ml.

buying 100Ml is paying for 130Ml, and the resource provider receives payment for 130Ml, but of this 30Ml is paid for through access charges to the infrastructure provider.

Figure 6. Options for Managing Losses



Option 1 is simple, Each company area would define a scaling factor which retailers would use to calculate the amount to charge customers.

However, option 1 has a major disadvantage: no company has an incentive to manage the volume of losses. Option 2 does this. The infrastructure company, which has control (at least over the long term) of the volume of losses can be incentivized to reduce losses to the extent that it is economically worthwhile to do so, provided that the price of water does reflect its value. In the first instance, we would expect the price of the losses paid by the infrastructure company to reflect the BST. Over time it would be possible to allow the infrastructure company to contract for replacing losses, so that it has the freedom to manage its own risks.

The incentive properties of Option 2 make it preferable to option 1, and we do not believe that it would be significantly more complex. It is therefore our recommendation.

5.6 Abstraction issues

The fundamental issue for our paper is what are the ***objectives*** of introducing scarcity based abstraction controls. We take these objectives to be the following:

(i) To facilitate the right level and type of investment in (a) new resources and (b) new water industry resource and other investment (including network and interconnector investment); and

(ii) To provide appropriate signals for efficient (including environmentally efficient) water use.

This can create something of a dilemma, which is set out in the following simple hypothetical conjecture.

Consider a simple scarcity price schedule[35], where abstraction prices for any given period and for any defined area increase with the degree of raw water scarcity in that area, probably in some non-linear manner. In that case, the relevant abstraction price for water areas that would satisfy both the objectives above would be the same *if and only if* there was no expected secular trend in E&W water scarcity over the next 30-50 years. But, the arguments for scarcity-based abstraction prices gain much of their force from the predicted 15% reduction in average and 50-80% fall in summer river flows by 2050[36]. Hence, if there were only *one* abstraction price schedule and *one* relevant abstraction price in any designated area for both investment and current use for any 3-5 year period, it would be either too low or too high for one or other of the objectives above.

If, the price were set to satisfy (i) – the investment incentive, the required scarcity abstraction price would be rather *higher* than current water scarcities suggest. The appropriate scarcity charge for an investment lasting 50 years in a water scarcity area (e.g. East Anglia) would be around the scarcity level expected in 25 years time (i.e. 2030) rather than the levels appropriate for 2012-15. On current expectations, the 2030 scarcity price would be considerably higher than the scarcity price appropriate to 2012-2015. Conversely, if the objective were to satisfy (ii) – to provide appropriate effective signals for efficient (including environmentally efficient) water use in 2012-15, any single area abstraction price would be too *low* for environmentally efficient long-lived investments.

The characterization above is clearly over-simplified but it does highlight some of the major issues. In subsequent sections, we focus primarily on objective (i) – ensuring that *new investments* face the necessary scarcity based abstraction signals. We do so because:

(i) Evidence on price and income elasticities of demand for water use is very limited but what we have suggests that they are very low, particularly in the short-term. (Note that the standard Weitzman assignment rules[37] suggest that this would be a case where, at least in the short run, quantity

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35 Or quantity equivalents.

36 See Environment Agency (2008). Summer river flows could more than halve by 2050 due to climate change. Available at http://www.environment-agency.gov.uk/news/94724.aspx?page=8&month=10&year=2008

37 See Weitzman (1974)

limits are more likely to be preferred to price controls. Low price elasticities require large increases in prices to choke off excess demand.)

(ii) Partly for the reason above, the economic efficiency costs of providing the wrong signals for very long-lived investments look to be high and long-lasting whereas the consequences of providing the wrong signals for current use look to be relatively low and readily remediable – at least on an annual basis[38].

(iii) The relatively low penetration rate of current water metering in England and Wales households further reduces the impact of abstraction pricing – even assuming that wholesale price changes are transmitted into inter-regional price changes.

Of course, in reality, it would be quite possible – indeed highly likely – that there would be more than one price schedule and/or there would be mixed price and quantity scarcity instruments[39]. This would allow at least one instrument per target, unlike the hypothetical example above, which would be important in helping eliminate some of the problems identified above, particularly on very short-term (e.g. seasonal) water supply problems.

Alternatively, we could imagine the Environment Agency and/or Defra issuing a reference path projection of future area-based water scarcities (e.g. at 3-5 year intervals). These would - at least in theory - allow market participants the possibility of constructing long-run future time-paths of periodically revised abstraction prices[40].

These and other abstraction options are clearly very important for any policy decision for scarcity-based abstraction prices. However, both of them imply major departures from the current abstraction policy position and instrument choice. Focusing on abstraction incentives most appropriate for investment decisions by companies in the period up to 2020/2025, we suspect that shadow abstraction prices are likely to be most relevant for developing the FPL model. The more radical abstraction variants are, however, highly relevant for moving towards our suggested long-run models – and could readily be included in our BST model.

Note, though that even for the shadow price option, projections of future raw water demand and supply will be needed for 30-50 years ahead.

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38 Seasonal issues are very important in water abstraction and we discuss them to a very limited extent in Section 5.

39 See Policy Exchange (2011) and WWF (2011) for mixed price and quantity proposals.

40 Compare with carbon pricing markets like the ETS.

5.7 Transition mechanisms

A part of our overall objective for market reform set out in section 3 above is to ensure that companies have the appropriate incentives to develop new resources. This means that resources should be developed when the LRMC of those resources, including environmental costs, is lower than the expected market price. That is the requirement for *new* resources. Existing resources, though, are already operating, and investors have a legitimate expectation of earning a reasonable return on any investment already made.

We think it is also important to ensure that the overall regulatory and contractual framework should allow for the resources business to be able to be separated from the infrastructure business (which does not mean that it would necessarily actually be separated).

Are transitional mechanisms necessary to achieve these objectives? Transitional arrangements may not be necessary if:

- LRMC prices are not volatile;
- there is confidence that the LRMC would recover appropriate revenue for the resources business;
- costs in resources are largely operating rather than capital costs; or
- the NPV of future profits at LRMC for existing resources is much larger or smaller than the associated RCV

But, it seems likely that at least one of the above conditions will not be met under our proposals.

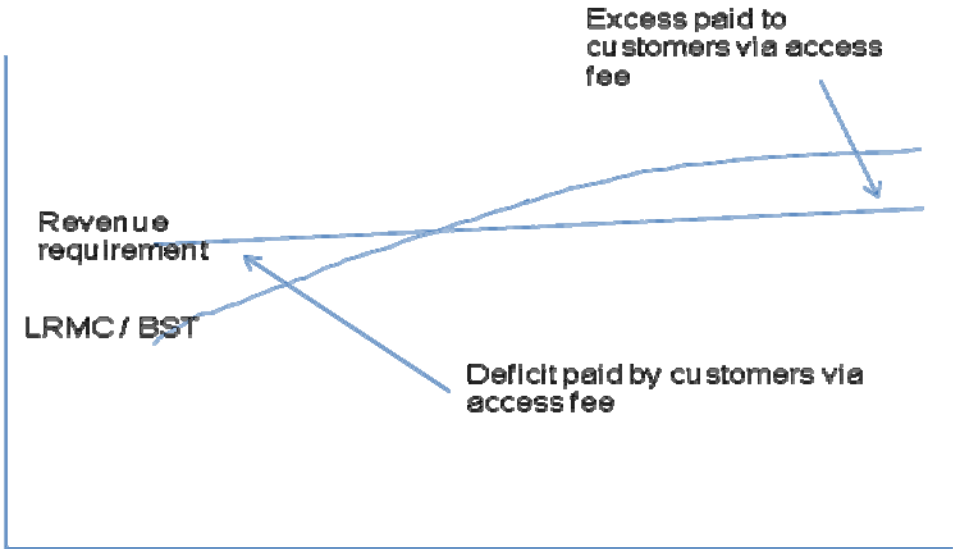
A transitional mechanism would allow future investment to be based on market prices, while existing investment is assured a return. One design for such a mechanism would involve:

(i) All resources receive a price based on contract prices (for free-market sales) or LRMC (for BST sales); and

(ii) In addition, identified historic resources (existing today or in 2015) receive a transition payment. This transition payment would be calculated as the difference between the revenue requirement, and the LRMC. It would be positive (if revenue requirement is above LRMC) or negative (if revenue requirement is below LRMC).

The result of this would be that customers would benefit from the economic rent of any existing resources. Developers would get the benefit of the market price or LRMC for any new resources. This is shown in the diagramme below.

Figure 7. Transitional mechanism



There are various ways by which transitional payments/deductions can be made. One method frequently adopted is by adjustment to allowed network revenues and prices. This has the advantage of minimizing competitive distortions and it is also a published adjustment to a regulated price.

5.8 Network boundaries - Reservoirs

We have recommended above that:

(a) all within-company network pipes (raw and treated) be allocated to Network Plus and included in the Network Plus sub-price cap; and

(b) system operation be allocated to Network Plus.

There remains the question of where reservoirs should be allocated. ***In principle, our recommendation is that reservoirs that are crucial for rapidly responding water availability be allocated to the network element. That would include reservoirs that are required in cases of demand surges, supply cuts, etc ("service reservoirs)". All other reservoirs would be allocated to Resources.***

Are reservoirs part of the network or part of the resources business? It seems clear that companies without network businesses that own reservoirs would seek to maximize the value of the water in the reservoir by holding it until the times when it is most need, i.e. when prices are highest. Depending on the equipment installed, there may also be opportunities for them to buy water at times of low price, store it, and release it, thus arbitraging between prices e.g. between seasons.

This type of arbitrage is appropriate, and there is no *prima facie* reason why it should fall into a regulated network business.

There are also smaller storage facilities very closely interlinked with network activities that are integral to the operation of the system. It appears to us to be artificial to try to separate these from the network operations.

We recommend that the treatment of reservoirs should be pragmatic: some will be resources, some properly part of the network business. In most cases, we suggest there will be no difficulty in forming a judgment as to which category the asset should fall into.

This treatment matches our understanding of the UK gas industry. Long term storage used for managing intra-seasonal demand is almost all under the control of Centrica (the Rough field). Other shorter term storage, including the use of "line pack" is under the control of the network operator (National Grid Gas for gas transmission).

5.9 Related proposals

While preparing this paper, we came across the recent proposals by Severn Trent with Ernst and Young. We were very encouraged that the ST paper was very pro-trade and, like us, suggested using forward-looking water resource LRMC prices as the major starting point. However, we also had a number of fundamental problems with their recommendations.

We think that our proposals are both more comprehensive (e.g. in terms of water scarcity and treatment of network issues) and create a genuinely level playing field for water trading in the way that the ST proposals do not. Our views on their paper are summarized in the Text Box below.

Text Box 2

The Severn Trent Proposal

Severn Trent (see Severn Trent & Ernst & Young 2011) published a paper in June 2011 which set out a proposed framework for facilitating trade. They also set out the legislative and other changes that would be needed to accommodate this.

The most important economic elements of the proposal are:

- The incumbent company would prepared demand forecasts;
- The incumbent company would prepare a draft Water Resource Management Plan based on their own opportunities to meet future demand needs;
- Third parties would have an opportunity to offer to supply water to the incumbent company at a particular price;
- The incumbent company would be required to accept bids from third parties that are lower than the incremental cost of supply in the draft WRMP;
- All offers by third parties accepted by the incumbent company would receive the incremental cost; and
- All resources developed by incumbent companies would be added to the RCV as at present.

We find a number of the ideas in this paper very interesting. In particular, we think it is important that a company has proposed the use of the data contained in the WRMPs in a commercial framework as part of a framework for determining commercial arrangements. This echoes one part of our proposal. But, our proposals explicitly integrate water shortage and abstraction charging into these LRMCs in a way that the ST proposals do not.

In addition, the ST proposals do give a privileged position to the incumbent. It both controls the bidding process, and offers its own resources into the bid process. Evidence from other infrastructure markets strongly suggests that such arrangements do not contribute to efficient and effective market opening.

In addition, the proposals are discriminatory. The commercial arrangements for the new resources proposed by an incumbent are totally different from those of a third party. The incumbent gets the cost of its resources added to the RCV and receives a secure return, rather than a price determined by the auction. The incumbent also enjoys the security of the RCV on its investments. Conversely, a third party receives totally different incentives (with no such additions to its RCV). Finally – and crucially - there are no access pricing proposals (which Severn Trent suggests would be too complex to implement).

It is worth noting that the ST proposals have elements in common with the failed system of access of independent generators to the electricity system in England & Wales before privatization and restructuring in 1989, which we discussed in Section 4.1.1 above.

Proposals like these make sense for a company seeking to procure water to meet its supply obligations. Under our proposals an incumbent would be free to operate such a system if it chose to. However, under our proposals, new third parties would (a) be free to bid into such a system, and (b) would have the opportunity to sell direct to their own customers in the competitive market. In addition, incumbent water companies' resources would face the same economic incentives as those of third parties and customer prices would also reflect the incremental costs in the WRMPs – at least for eligible customers able to choose their supplier.

6. Conclusions

Debate about introducing market mechanisms in the England and Wales water industry have been going on for many years. There is now general acceptance that reform is needed, but there are major barriers to reform.

In designing a new market framework it is important to bear in mind the objectives of reform. ***In our view, the most important of these is to provide strong incentives to current and future industry participants to build the right infrastructure at the right price.***

To achieve this, we recommend a relatively straightforward market framework, with simple design choices where possible. The key points are:

- All wholesale and eligible retail water customers will be offered a default tariff or a bulk supply tariff (BST) covering the resource component of water costs. This will reflect the marginal costs, including the scarcity costs, of future water supplies;

- All wholesale and eligible retail water customers will be free to contract outside this arrangement, should they choose to do so;

- Trades within a company region will be considered to be in one trading zone, and so would not require any additional network charges. Trades between company regions would, though, require the payment of additional "interconnect fees";

- An access pricing regime is essential. To facilitate swift implementation, we recommend a "postage stamp" approach to access pricing in the first instance for trades within a company region. Interconnect prices would be additional to this, and would be subject to inter-company negotiation, with oversight from Ofwat; and

- Transitional arrangements can ensure that water companies receive revenues to reward past investment in the RCV, and at the same time future investment will be justified only if investment is in the lowest cost resource.

These proposals would enable the companies and Ofwat to establish a clear and reasonably economically efficient upstream raw water Resource price which acts *both* as a marker price for competitive wholesale and retail purchasers (i.e. a "price to beat" for upstream entrants) *and* as a regulated wholesale price for retailers selling to households and other customers without retail choice.

Provided that there is sufficient retail competition, we think that this model has strong internal incentives to develop into a more thorough-going market model like bilateral trading, particularly with active shareholder pressure. However, if progress on retail competition and other developments were slow, we think that this model would be a clear

improvement on the current vertically integrated model. It would, for instance, be readily applicable to current Welsh Government proposals which reject further retail competition.

We are confident that our proposals can and should be implemented in PR14. There will be some compromises between what is economically ideal and what can be implemented. But careful design means that the simpler choices necessary for early implementation should not distort investment and other long-term decisions unduly. Moreover, provisions can be built in to ensure an interim Ofwat review can take place if something is of real concern.

Of course, there is a need to develop these ideas in much more detail. Key areas where more work needs to be done are:

(i) Developing forward looking LRMC prices that incorporate water resource concerns (i.e. establishing shadow or real scarcity based abstraction prices);

(ii) Developing "postage stamp" intra-company interconnection prices and an access and pricing framework for inter-company interconnection; and

(iii) Deciding on how much retail competition will be implemented and when.

We have deliberately focused on trying to develop a framework that is evolutionary rather than revolutionary. To make the changes we are recommending in time for PR14 will require much hard and detailed work. However, we do not believe that this is inherently more difficult than comparable regulatory reform exercises such as the 1990s UK gas reforms or the creation of effective retail telecom markets. With the existence of well-founded WRMPs and Ofwat data on accounting separation, such reform is readily achievable.

October 2011

REFERENCES

Anglian Water, Cambridge Water Company and Essex and Suffolk Water (2010). *Trading theory for practice: A report on opportunities for water resource sharing in East Anglia.*

Armstrong, M. Cowan, S. and Vickers, J. (1994). *Regulatory Reform: Economic Analysis and British Experience.* MIT Press.

Cave, M. (2009). *Independent Review of Competition and Innovation in Water Markets: Final Report*.

Environment Agency (2008). *Water resources in England and Wales: Current state and future pressures.*

Grant Thornton (2010). *Cost Benefit Assessment for WICS.*

HM Government (2011). *The Natural Choice: Securing the value of nature.*

Littlechild, S. (2010). *The Creation of a Market for Retail Electricity Supply*. EPRG Working Paper No. 1017.

Ofwat (2010). *A study on potential benefits of upstream benefits in the water sector in England and Wales.*

Ofwat (2011). *Future Price Limits – a preliminary model: informal consultation*

Ofwat (2011). *Affordable for all – how we can help those who struggle to pay their water bills*.

Policy Exchange (2011). *Untapped Potential: Better protecting rivers at lower cost.*

Severn Trent Water (2009). *A framework to implement a water trading model.*

Severn Trent Water with Ernst &Young (2011). *Changing Course through Water Trading.*

Stern, J. (2009). *Introducing Competition into the England and Wales water industry: Lessons from UK and EU energy market liberalization.* City University, CCRP Working Paper No. 13 (and Utilities Policy, September 2010).

Stern, J. (2010). *Developing Upstream Competition in the England and Wales Water Supply Industry: A New Approach*. City University, CCRP Working Paper No.17.

Stern, J. (2011). *System Operators: Lessons from US and EU Energy Industry Experience and Implications for the England and Wales Water Industry.* City University, CCRP Working Paper No.18.

Vickers, J. and Yarrow, G. (1988). *Privatization: An Economic Analysis*. MIT Press.

Water Industry Commission for Scotland (2011). *Annual Report.*

Walker, A. (2009). *The Independent Review of Charging for Household Water and Sewerage Services.*

Weitzman, M.L. (1974) *Prices Vs. Quantities.* Review of Economic Studies.

World Wildlife Fund. (2011) *The Itchen Initiative.*

ANNEX

Generic Abstraction Methods and their Pros and Cons

In this Annex, we briefly discuss the main pros and cons associated with the abstraction options discussed in Section 3 of the main paper.

1) Scarcity based abstraction (and discharge) prices

- These are economists' preferred solution but raise political economy concerns about affordability, use of revenues, etc;
- The initial impact is on wholesale (bulk water trading) prices and not necessarily on retail (particularly retail domestic prices) but affordability concerns remain;
- Difficult unresolved questions remain on how to how to set scarcity based prices e.g. number of bands, how graduated, etc; and
- Some information exists in Australia and the Western USA on how abstraction markets might work but it is very limited and it is unclear how this would translate to the UK.

(Note that the Cave Final Report paras 3.59 and 3.60 suggested simple surcharges for (a) over-licensed and (b) over-abstracted areas – a possible useful starting point)

2) Quantity based abstraction (and discharge) limits with tough penalties for breaching abstraction limits

- They have the same economic impact on water use incentives as price equivalents – quantities are the dual of prices;
- Their impact on wholesale and retail prices is less directly apparent and may (perhaps) be lower but is still present;
- They require strong enforcement and effective penalties for over-abstraction;
- They are difficult to put into a market framework unless there are auctions for quantities – long and short term (Auctions raise other sets of problems);

- The problem of setting appropriate levels of gradation and the number of limits is probably more difficult than for prices – but the Environment Agency has a lot more experience on quantity setting than price setting; and
- This may well require abstraction licence reform. Currently, over 25% abstractions have no specified quantity limits.

3) Percentage Limits on Abstraction

- Abstraction licence holders' water rights are defined in terms of a % of declared available water rather than as a quantity:
  - This model used for water rights – and water trading - in Victoria, Australia and for fisheries (e.g. New Zealand);
  - Copes very well with annual and seasonal variability around a trend; and
  - Very market friendly and can be largely self-regulating - at least provided that ownership concentration of abstraction rights is not excessive;

- This model would almost certainly require separating abstraction *rights* from abstraction *licences e.g.* as codes or similar;

- In Australia and Western US, these schemes have mainly been devised for incentives on agricultural uses of water or agriculture-urban;

- Gives strong scarcity signals for companies but retail customers (especially households) may need some protection from price variability; and

- A good market and market friendly reform but likely to require major legislative change in UK context.

4) Shadow Price of Water Scarcity incorporated into Resource Price

- Operates like a standard abstraction price if done for all abstracted water – at least for intra-company water use. (The impact on inter-company water trade incentives very unclear);

- Unclear how it might be applied to new upstream/abstraction market entrants;

- Unclear whether can be applied to discharges or whether alternative required;
  - Provides some incentive for recycling etc to minimise abstraction costs;

- Raises essentially the same issues pro and con as standard scarcity based abstraction prices – but arguably to a lesser extent.

5) Notional Shadow Price of Water Scarcity

The notional shadow price is not incorporated into the charged water Resource Price but is used for investment appraisal (e.g. in company business plans):

- This helps guide future investments ***but*** impact on water use efficiency muted and very long-term;

- Same questions arise as with other options over degree of gradation, number of area prices, basis for setting, etc but mistakes likely to be less costly;

- For good or ill, it postpones for many years the more direct impacts on incentives and wholesale prices;

- ***But***, may be easier to move earlier to higher scarcity prices with notional price cap than with "real" paid abstraction prices/shadow prices. This would be good for aligning investment incentives for long-term.

This option is a possible (minimalist) starting point but unclear how it would evolve other than by further policy/regulatory intervention.