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Introducing Competition into England and Wales water industry: Lessons from UK and EU energy market liberalisation

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INTRODUCING COMPETITION INTO ENGLAND AND WALES WATER INDUSTRY – LESSONS FROM UK AND EU ENERGY MARKET LIBERALISATION

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Abstract

This paper summarises the experience concerning electricity and natural gas in the UK and the European Union since the 1980s with a view to drawing lessons for potential liberalization and the introduction of competition into the England and Wales water industry. The paper suggests that the main lesson from energy sector experience is the requirement is to develop upstream competition in the supply of bulk water both to retail supply companies and to large industrial consumers. The pattern of water supply and demand in England and Wales is that there are excess supplies in the North and West and supply shortages in the South and East. In consequence, provided that there is sufficient interconnection capacity within and between regions, there should be major potential gains from trade both in bulk water supplies as well as in trade of abstraction licences. Such trade can offer potentially sizeable environmental benefits in terms of water sustainability as well as in short and long-term efficiency benefits to consumers. The paper concludes with recommendations for some experiments with abstraction licence and bulk water trading e.g. in the South East of England.

Introducing Competition into England and Wales Water Industry – Lessons from UK and EU Energy Market Liberalisation

1. Introduction, Purpose of Paper and Key Messages[1]

The Cave Review, commissioned by the UK Government in 2008, has explicitly raised the issue of the potential for liberalisation and the introduction of competition in the water and sewerage industry. There are very few examples of introducing competition into water supply but we now have over 20 years of experience with liberalisation and deepening competition in telecommunications, electricity and natural gas as well as other infrastructure industries. There have been common themes in that liberalisation experience so that surveying the history and results of that should be relevant for considering options for water industry liberalisation.

The liberalisation of physical network infrastructure industries, particularly electricity and natural gas, has followed a broadly similar pattern across industries and countries. Typically, the starting point in the UK, the EU – as well as North America and Australasia – has been a vertically integrated monopoly or semi-monopoly supplier, often publicly owned with limited physical interconnections to similar companies in neighbouring states/regions/countries. This model also applies, however, to other infrastructure industries.

The main pressures for the pattern of change that we have observed in the electricity, gas and other infrastructure industries are:

(i) *The desire to improve efficiency* – including energy efficiency, technical and cost efficiency and management efficiencies;

(ii) *The desire to increase investment and introduce private finance* – raising investment and avoiding the costs of that falling on the Government's budget have been very important and were crucial for the UK privatisation of both telecoms and England and Wales water;

(iii) *Pressures from industrial users, particularly large industrial consumers* – the strong wish of companies to choose their suppliers and have more control over infrastructure industry inputs (and lower input prices) has been extremely important for the development of competition in supply for the energy industries and is also a major driving force in the UK development of competition in water supplies. This is shown well in the structure of the Scottish Water reforms; and

[1] This paper has been written with the support of the Environmental Agency. I am also grateful for a number of very helpful comments on draft versions of the paper and, in particular, from the assistance of Ronan Palmer and Amanda Turner. Nevertheless, the analysis and views expressed in the paper are solely my responsibility and do not necessarily reflect the views of the Environment Agency or any of its staff.

(iv) P*ressures for transparency and environmental improvement* – privatisation requires strong growth in accountability and has led to the explicit introduction and development of regulatory institutions like Oftel/Ofcom, Ofwat, Offer/Ofgas/Ofgem, etc. Effective regulation requires transparency and cost unbundling. These, in turn, require the unbundling of networks from supply. Transparency, cost efficiency and effective regulation are greatly assisted by the introduction of competition into both the purchase and sales of the industry products, while maintaining monopoly regulation for the physical network(s).

Environmental improvement was not a major focus of energy industry privatisation or the introduction of competition in the 1990s and fears were expressed that, given the working of profit incentives, they might make environmental outcomes worse. However, growing environmental policy concerns firstly led to the development and growth in the powers of environmental agencies; and, secondly, led to far more explicit environmental requirements being imposed on energy, water and similar industries by the UK, EU and other governments. Over the last 10-15 years, these environmental requirements have grown significantly and the tools used to achieve them have become increasingly sophisticated. This has been shown clearly in UK, EU and US emission outcomes. For instance, UK sulphur dioxide emissions have fallen by over four-fifths since 1990 and energy industry particulates emissions by as much.

Experience in electricity and gas together with the development of emissions trading and other market based mechanisms rather than quantitative planning limits clearly demonstrate the benefits of trading mechanisms in reducing air pollution. In the US, there have been successful 'cap-and-trade' emission schemes for sulphur dioxide and nitrous oxide emissions and in the EU, the ETS cap-and-trade scheme has been sufficiently successful for it to be continued up to 2012 and beyond. However, the success of these schemes also shows how competition in the production and supply of electricity has been important for making effective these market-based environmental methods.

One particular point worth noting is that privatisation leads to a huge reduction in the degree – and incentive – to give explicit or 'blind-eye' regulatory waivers to energy and water companies. This is most obvious in Central and Eastern Europe and the former Soviet Union where environmental outcomes in energy and water. For energy, particulate emissions have fallen by around 50% or more in most CEE countries and in Russia between 1990 and 2006. There is, in addition, considerable and growing evidence that competition in supply significantly enhances these privatisation benefits to the environment[2].

In Section 2, I briefly outline the four main models of supply from full vertical and horizontal monopoly through to full retail competition and set out the main paths of change in the UK and EU. The focus will be on electricity and natural gas, but with more on gas as it is more relevant for water. In Section 3, I will turn to water competition in the UK, including potential models

[2] See EBRD Transition Report 2004, Chapters 3 and 4 and Annex 3.1

and their main pros and cons. In Section 4, I will briefly discuss some licensing issues, primarily Environment Agency abstraction licences, but also Ofwat water company supply licences with a view to setting up a framework that should encourage wholesale trading in water. Section 5 introduces transitional and implementation issues, particularly as they might affect abstraction licences. It also includes a brief discussion of planning and emergencies, drawing on energy industry and other provisions. Section 6 offers some very short concluding comments plus four suggestions for further quantitative modelling and other work to establish the practical feasibility and usefulness of the proposed approach.

Note that I will be focusing on lessons from the energy sector for water rather than on the England and Wales water industry per se. Although I have a reasonable familiarity with the technical and institutional aspects of water supply, I cannot claim any deep understanding of them. But, I can draw lessons from the earlier and more advanced movements to competition in electricity and gas. As concerns the water industry, in this paper, I focus on water supply and abstraction rights and will ignore sewerage issues, apart from emergency concerns. The latter can be considered in future work.

The key conclusions are that the lessons learned from gas and electricity competition strongly suggest that competition in the wholesale supply of water (and in the retail supply to large customers) should not only lead to significant benefits to consumers in terms of prices and quality; but also achieve significant improvements in the volume and pattern of water usage.

These benefits should arise primarily because there are many areas of England and Wales that have excess water resources, primarily in the North and West. These areas account for almost all of the unused licenced abstraction rights. They are, however, matched by a number of highly populated areas, primarily in the South and East, that have insufficient water resources and where abstraction rates are so high as to cause environmental damage. In 2007-08, there were 18 water resource zones with deficits, of which 3 (London, West Midlands and East Anglia) accounted for two-thirds of the affected population. In addition, in 2007-08, 7 water companies reported unplanned water deficits, again all of them in the South East and South of England[3].

In consequence, water trading should, firstly, encourage the development and utilisation of new water sources and water trade *within* regions; and, secondly it should encourage the development of and utilisation of new water sources and water trade *between* regions. In addition, because such trade provides a market price for bulk water, water trading also provides a stronger basis for water supply companies to balance the costs and benefits of demand management initiatives for reduced water usage as against those arising from the development of new water sources.

[3] In March 2008, of 119 water catchments in England, 18% of management units were over-licensed and 15% were over-abstracted. The vast majority of these were in the South-East with a few in the South and Midlands. See 'Managing Water Abstraction Interim Update', Environment Agency, June 2008.

In those circumstances, there are substantial potential benefits from trade – environmental benefits as well as consumer, efficiency and commercial benefits. Indeed, a well designed path towards greater competition in water supply involving trade in bulk water between companies is likely to provide the most effective way of valuing water, encouraging interconnection between water company networks, improving water usage efficiency, encouraging investment in both supply and water saving technology. This is very likely to involve water suppliers and traders other than the existing licensed water supply companies entering the wholesale bulk water supply market.

In this context, it is worth noting that the introduction of radio spectrum trading led to the emergence of large amounts of previously unused "hidden" spectrum that significantly increased supply. Something similar can also be expected for water supplies with the introduction of trade in bulk water.

One useful way of considering the above is to think of water abstraction rights and associated trading in a 'cap-and trade' manner where trade between high water resource areas and low water resource areas is strongly encouraged by strongly enforced caps on water extraction in low water resource areas. Thus, they would be analogous to the EU cap-and-trade regime for greenhouse gas emissions from power stations and other large industrial plants. The caps would be environmentally determined – and may well be made tighter over time - but, they would need to be rigorously enforced.

These potential benefits should become available from the development of upstream water competition alongside more explicit and tougher market based environmental regulation. Indeed, the patterns of UK water supply and usage suggest that the gains from trade (including the environmental benefits) could well be higher for water than for energy, although much more analysis – particularly quantitative modelling - would be needed to demonstrate (or refute) that conjecture. The key question is whether there is sufficient pipe interconnection capacity within water basins and regions to allow sufficient trade to equalise marginal prices for bulk water between via arbitrage between areas. That does not require large trading volumes per se let alone large volumes of transported water (with associated high energy costs) but it does require an absence of network bottlenecks that would prevent marginal price equalisation.

Of course, further development of this simple conceptual model is needed as well as confrontation with the data. For example, even in areas where 'no water is available', it will still be possible to take water at very high flow and store it. (There are a number of reservoir proposals to take advantage of this). Hence there could be a supplementary market in 'high flow' abstraction rights[4]. In addition, any model on these lines also needs to take account of water treatment plants, which can be monopoly or semi-monopoly essential facilities in water supply) as well as waste water issues.

[4] This would be analogous to gas storage peak availability and peaking plant in electricity viz. pumped storage.

However, perhaps the most important issue is that there seem to be virtually no examples of liberalising water reform anywhere in the world. Hypothetical and theoretical models can only take one so far; practical evidence of what does and does not works and why is crucial for devising robust frameworks. Unlike the UK electricity and gas reforms of the 1980s and 90s, there is no evidence from elsewhere as to what works and what doesn't for water competition, upstream or downstream. That in itself strongly suggests taking an experimental approach where one or more options are tried in different areas.

The Scottish Water model is one ongoing experiment and is providing much useful data. For England and Wales, it seems sensible also to try alternative experiments in one or more areas, including bilateral trading options. Taking an experimental approach of this kind would not only avoid long-term policy commitments on the basis of very limited information but would also generate data for evaluating alternatives.

An additional reason for an experimental approach to water competition design in England and Wales is that there is no obvious prima facie reason why market structures need be the same across the country. They do need to be the same for electricity and gas with national single transport/transmission facilities, but water has never been provided on a national basis. It has been – and is likely to continue to be – provided by local or regional companies with water drawn from river basins with different characteristics. Experiments will allow an investigation of different models and/or model variants to establish what works best, where and why.

2. Models of Infrastructure Industry Supply

For water, like gas and electricity distribution, there are four generic models by which the supply chain is organised from production through to consumption[5]. These models are:

(i) the vertical and horizontal monopoly model;

(ii) the single buyer (or centralised purchaser) model;

(iii) the wholesale competition model; and

(iv) the retail competition model.

In the monopoly model, there is either no competition of any type (or, for gas, very limited upstream competition). For the single buyer model, there is upstream competition to supply distribution companies; this is typically franchise competition – i.e. competition *for* the market based on competitive tender to transmission or distribution companies for long-term gas supply or electricity generation contracts. The final two models include explicit competition *in* the

[5] This typology was originally set out in S. Hunt and G. Shuttleworth, '*Competition and Choice in Electricity*', Wiley 1996. It has since been very widely for gas as well as for electricity and extended.

market for supply of electricity and gas either just for distribution/supply companies or, for some or all retail consumers. This typically results in a spread of contracts between gas producers/electricity generators and supply companies of durations from 1 day ahead to many years ahead.

I set out below a brief summary of each model, focusing primarily on the gas industry. I focus primarily on the gas industry as, like water, there aren't the sensitive virtually instantaneous system balancing issues that are crucial for electricity markets. In addition, gas and water typically obtain large percentages of their main upstream input from a small number of far-way locations and storage is important for both. Neither of these holds for electricity.

(i) ***The Monopoly Model***

This model provides the starting point.

In the UK, British Gas owned most of its gas supplies, owned and operated the gas transmission and networks and storage facilities. This was true both when it operated as a nationalised company and after privatisation in1986 until 1995. BG was also the monopoly supplier of gas to almost all retail customers.

BG did buy in some gas from other North Sea operators and, from around 1982, there was the legal possibility for large industrial consumers to buy gas from other suppliers <u>if</u> they could negotiate pipeline access terms and prices. However, virtually none were able to negotiate these so that – like with current water inset agreements – these were virtually a dead letter and downstream competition was, in practice, virtually non-existent. There was some limited upstream competition in exploration and production of gas.

The complaints of industrial and other users – plus the difficulties of regulation and repeated conflict with Ofgas – led to two MMC enquiries by which BG was forced to divest itself of a substantial percentage of its industrial gas supply contracts. It also, following a second MMC enquiry, voluntarily broke itself up into separate network, exploration and production and supply companies which de-merged in 1997. The consequence was strong gas supply competition, particularly in the industrial market, higher efficiency, lower prices and fewer supply interruptions.

Electricity followed a similar path except that its initial position was that it owned almost all England & Wales generation. In addition, electricity was unbundled and generation broken up at privatisation. Also, there was in place an electricity interconnector between England and France which allowed peak demand power swaps.

The monopoly model was also the norm for most of continental Europe in both electricity and gas until the mid 1990s and later in Central and Eastern Europe. Ownership was sometimes public, state owned (e.g. France and Italy) sometimes private (Germany) and sometimes local community (Denmark). US electricity was also organised in the same way by State until at least

1980. In all cases, there was limited physical network interconnection but no real wholesale markets for gas or electricity. Even today, gas supplies at national level on the Continent are dominated by 25 year take-or-pay contracts to large 'national champion' gas companies.

The monopoly model is a stable equilibrium but its increasingly criticised performance in terms of trends in efficiency, costs and innovation have led it to become much less popular across the developing world as well as in the EU and other OECD countries. It is also extremely difficult to regulate - and with which to encourage environmental improvements.

The monopoly model also best represents current water arrangements in England and Wales. For water, there is no national transportation network but a series of weakly interconnected physical distribution networks. Water companies mainly own their own water supply sources (rivers, reservoirs, etc) but a few are shared and there are some limited water swap arrangements but not at prices determined by the wholesale price value of water for given (and regulated) retail prices.

(ii) *The Single Buyer Model*

This model has never really taken off in gas but has been used in electricity in some Asian and other developing countries.

In its purest form, there is a single national buyer of bulk generation (or gas) – typically the main electricity/gas supply company - that buys in bulk supplies from other companies on long-term (usually take-or-pay contract to supplement supplies from sources that it owns and operates. However, Austria and Germany operated models under which there was a single buyer at municipal level which negotiated exclusive contracts with national supply companies and, in the US, local distribution companies band together to purchase electricity and gas from large suppliers. This allows small local companies to achieve some benefits of economies of scale and scope.

Certainly in its main national form, the single buyer model is not a stable equilibrium model but is a transitional model which allows vertically integrated power companies to buy in additional generation on long-term contracts without the introduction of sufficient competition to pose any real challenge to the incumbent supplier's costs or efficiency. At French insistence, this model was included as an option to wholesale competition in the first EU Electricity and Gas Directives in 1996 but neither they nor any other country adopted the option. The German and Austrian variants largely survived – but with high prices - until full retail competition became mandatory in the second round of EU Electricity and Gas Directives of 2003, but now the Austrian and German long-duration contract collective purchase arrangements are now effectively disappearing.

The single buyer model has come under increasing criticism in electricity as experience with it has grown. It appears to encourage over-investment and supports high costs and prices. It is also very vulnerable to manipulation and corruption. The weakest versions, like voluntary joint

purchase as by US distribution companies, may have some benefits where local distribution and supply companies are small. However, the case for compulsory single buyer arrangements is weak[6].

A particular variant of the single buyer model has been applied for water in Scotland but there seem to be particular political reasons as well as economic and legal constraints as why it was adopted there. In Scotland, water retailing companies (4 at present) are allowed to buy treated water from the national publicly owned monopoly (which currently covers abstraction, treatment and the pipe networks) to sell to non-domestic customers. Thus, both the Scottish Water retail subsidiary and the new entrant companies can sell treated water to all privately owned businesses in Scotland as well as to all Scottish public authorities and businesses. This is equivalent to a single buyer model but without any upstream competition. However, even if this were to remain the best option for Scottish water does not mean that it is necessarily the best option for England or Wales (or England alone).

For E&W (England and Wales) water, there have been suggestions (including the Cave Review Interim Report[7]) that the single buyer model might be a good starting point for supply competition, but the evidence for electricity suggests that this is very unlikely – apart, perhaps, for voluntary purchase entities by individual companies. This might possibly suit some water-only companies or companies with low levels of owned supplies. Otherwise a direct movement towards wholesale competition and competitive supply to large industrial consumers may well be better.

Since the Interim Report of the Cave Review cautiously promotes the possibility of a single buyer model for water competition in England and Wales, it may be useful to set out a fuller statement of the pros and cons of this model both for energy industries and for water. This is done in Annex 1.

(iii) *Wholesale Competition*

Wholesale competition, in its pure form, is the structure under which there is a competitive upstream market in which contracts are agreed and operated to sell bulk gas to regional/area retail supply monopoly markets. The contracts include delivery contracts for many years ahead, 12 moths ahead, 1-3 months ahead, 1-4 weeks ahead and on-the-day contracts – and there has developed sets of forward contracts and option contracts for wholesale gas and electricity over the last 10 years or so.

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6 For an excellent survey of single buyer models and their pros and cons, see Arizu, Gencer and Maura, 'Centralized Purchasing Arrangements: International Practices and Lessons Learned on Variations to the Single Buyer Model', World Bank, 2006. The paper can be found at http://siteresources.worldbank.org/INTENERGY/Resources/CentralizedPruchasing.pdf

7 'Independent Review: of Competition and Innovation in Water Markets', Cave Review Team, November 2008, http://www.defra.gov.uk/environment/water/industry/cavereview/pdf/cavereview-report.pdf

In practice, wholesale competition has yielded competitive markets for sales to regional/area suppliers, but large industrial consumers have been almost always able to buy direct from gas producers and similarly to buy electricity direct from generators[8]. This was the model instituted in the UK during the 1990s and was also the basis for the 1st EU Electricity and Gas Directives of 1996. However, supply and distribution (pipes and wires) companies were not required to be legally separated and regional/area supply and distribution were kept together – as is still the case in England & Wales water. Separate accounting between supply and distribution gradually developed, followed by separate licences, separate businesses and (in the UK) separate ownership.

Under this model, after 1996, any UK gas (or electricity) supply company could buy its gas (or electricity) from any licensed producer or trader anywhere in the EU – and similarly for large industrial consumers.

Of course, if a UK supply company bought gas from German Eon, it wouldn't be supplying its UK customers with German gas molecules: Eon would inject into the German network a volume according to the contract and a series of swap contracts would then take place along the physical gas pipeline networks connecting Germany to the UK. The UK company would pay Eon for the gas but probably 1% or fewer of the gas molecules supplied to the final customers would have originated with Eon.

As I will argue below, this swap model of interconnected gas systems may provide a useful way of thinking about how water competition might best be developed in England and Wales.

(iv) ***Retail Competition***

In this model, all consumers – households and other small users as well as large industrial customers - can buy gas (or electricity) from any licensed producer, supply company, trader or other entity. This model has become in recent years the legally binding model in the EU and has been so in the UK since 2002. It is also the model legally binding model for gas and electricity in much of Australia, New Zealand and some US states.

In this model, supply and distribution are typically separated and there is mandatory business if not ownership separation as well as separate licences.

In practice, there are great differences between countries in the percentage of consumers who have switched suppliers. For countries like the UK, over half of households have switched suppliers since retail competition has been introduced for energy but, in Belgium, France (and for US electricity), only about 10% or less have done so. This is primarily because those countries retain a regulated retail price for small consumers, unlike the UK.

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[8] In EU terminology, the large industrials were designated as "eligible consumers". Pre-EU accession Central and Eastern Europe was an exception to exempting large industrial consumers from the local supply companies' retail monopoly.

A major development in the UK has been in dual-fuel retail supply contracts and multi-utility companies who offer energy and sometimes telecoms. For instance, Centrica, which was formed out of British Gas, has a major presence in both gas and electricity production, wholesale and retail trade and is a market leader in dual-fuel household contracts. Similarly, United Utilities started as a water company who went into telecoms and electricity distribution but has since sold off its telecom and electricity interests.

Although the full retail competition model, with competitive supply to household consumers may be *one possible* end-point of introducing water competition, it is clear that it would take many years – if not decades – to be developed and may never arrive. This is because:

(i) it will take many years to do the necessary unbundling of the water supply companies to allow retail competition;

(ii) it will require extensive experience with wholesale competition before it can be seriously contemplated – and before the costs and benefits for moving to retail competition can be estimated;

(iii) metering of all customers would be needed (or at least metering of all customers with choice of retailer) plus extensive – and probably controversial - retail tariff rebalancing; and

(iv) it is likely that retail price regulation will remain in place for the foreseeable future.

One final point worth noting is that most real-world energy reforms embody elements of all the main models, particularly in their early stages. Hence, in the UK, the initially unbundled electricity industry retained local Public Electricity Supply Companies whose supply arms acted as a single buyer for the retail customers other than large industrial consumers[9]. In addition, standard early Continental EU energy reform involved limited separation between upstream electricity or gas production , network elements and supply so that they combined elements of the standard monopoly model and wholesale competition.

Any successful introduction of competition into upstream (wholesale) water and/or retail supply will again also involve elements from more than one model. However, for water, there may be useful scope to allow – or even encourage – regional variants with different combinations. Nevertheless, as a medium-term objective, the results of the energy sector reforms in the UK, EU and elsewhere show that significantly more success has been had with initial reforms based on wholesale competition plus retail choice for large industrial consumers.

[9] The municipal Stadtwerke in Germany (and their Austrian equivalents) also acted as local single buyers until the Second EU Electricity and Gas Directives mandated full retail competition.

3. Competitive Models for the England and Wales Water Industry

Following the discussion in Section 2 above, the discussion of water competition in England and Wales will focus on the wholesale competition model but with retail competition for large industrial consumers. This was the model introduced for electricity in the UK after 1989 and which progressively developed in practice as well as on paper for gas in the 1990s. It was also the main model in the 1st EU Electricity and Gas Directives of 1996.

The Cave Review Interim Report considers a variety of options and leans towards the single buyer model (under the guise of 'independent purchasing entity') but is careful not to rule out bilateral trading or other models. (See discussion in Chapter 8 of Cave Interim Report.)

For gas and electricity, the wholesale competition model has proved to be far superior to the single buyer model. The single buyer model has few incentives for higher efficiency – indeed, it typically leads to excessive investment. In addition, it fails to meet the requirements of industrial consumers for greater choice; it is both opaque and difficult to regulate and appears to have very weak incentives for environmental improvement. Conversely, for E&W water supply, as recognised in the Cave Interim Report and elsewhere, the full retail competition model including open choice of supplier to domestic customers is many steps too far.

This is not to rule out some voluntary collective purchase variants of the single buyer model for E&W water but they are likely to be marginal. In addition, we would also expect some degree of retail competition to be allowed – indeed encouraged – for the largest consumers and for the 'large user' definition to be progressively relaxed - as happened with electricity and gas in both the UK and EU (and other) jurisdictions.

As indicated in the introduction, the expectation is that wholesale competition would develop by contracts within and between water surplus and water deficit regions/areas. It may well be asked how this can happen without a water 'national grid'. The answer is by injections into the system at one point with transport via physical network interconnections between areas. Interconnection may initially be limited – and there may be one or two areas that are not interconnected, (including islands, remote areas, etc.), but this should be sufficient to initiate a swap-based trading system in bulk water as has developed e.g. between states in EU gas markets. In addition, the development of the trading system should also encourage the construction of more interconnection where there are significant gains from trade.

Even if the wholesale competition model is taken as the norm, there are still many important sub-issues to be considered. Experience in the gas and electricity sector suggests that the most important for England & Wales water would include:

(a) *How far water companies for the water supply business (ie excluding waste water and sewerage) are obliged to separate their various activities: water abstraction and treatment, water distribution, wholesale and retail water supply and any other ancillary services.*

Business separation is essential; legal and/or ownership separation are both highly desirable but may take 5-10 years or more to achieve. (It was because of such timescales that no such separation was enforced at the time of privatisation on either British Gas or British Telecom.)

For water, Ofwat are beginning to develop accounting separation. Once this has been achieved, business separation (i.e. separate management) should not take too much longer but the timescales are clearly around 3 years for each major element.

The key element, as recognised by Ofwat[10] is the separation of pipe networks from supply and trading[11] .

(b) *Ownership of traded water needs to separate ownership of water from pipe transport*

In the UK and US, gas companies operate with totally separated businesses for supply and pipelines. This means that the transport pipeline companies have no ownership rights over the gas. That does not hold for most Continental European gas or companies and the resulting conflicts of interest between pipeline and supply parts of the gas companies so that competitive wholesale markets have failed to develop on any scale[12].

Within the EU, there are major issues in providing gas interconnection between countries. Pipeline capacity is booked up many years ahead but much of it is unused. Not surprisingly, there are still significant persistent differences in wholesale gas prices between neighbouring countries even with physical interconnection. This has been the subject of a major, highly critical report by DG Competition.

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10 See, for instance, Ofwat 'Review of Competition in the water and sewerage industries: Part II', May 2008, http://www.ofwat.gov.uk/competition/pap_con_reviewmrktcomp.pdf?download=Download#

11 Water treatment works may also operate as monopoly (or near monopoly) essential facilities and may either need to be included with pipe networks or be made into open access operations with regulated access prices and conditions.

12 For further discussion of this, see the recent Energy Policy Blog by Christian von Hirschhausen and articles by Jeff Makholm as well as the 2006-07 DG Competition Reports on the EU Energy Market.

For England & Wales water, it will again be crucial whether or not water network companies have any ownership rights over the water transported. It is important that they do not have ownership rights over the water, as applies to UK gas and electricity network companies. That implies separate (cost-based) network tariffs and water trading solely between supply arms. Wholesale competition is unlikely to develop beyond a small scale (e.g. for peak reductions between areas), unless or until such a framework is put into place.

(c) *Storage*

Gas market developments show that competitive markets need more close-to-market storage than monopoly markets –and this may well also apply to water. Who owns this storage is crucial as are access terms.

Low UK gas storage levels have been a matter of concern – and it has been suggested that this might have contributed to wholesale gas prices rising relatively rapidly in response to demand pressures. However, this has become less of a concern with the development of LNG (liquid natural gas) trade and terminals.

For water there is no direct equivalent to LNG substitution for natural gas but water storage may well become more important should climate change introduce a higher incidence of drought years. In addition, any growth in bulk water trading could well require rather more close-to-customer water storage than is currently provided by small storage reservoirs and refilled aquifers.

(d) *Water Quality*

It is sometimes argued that the non-homogeneity of water arising from different levels of quality – unlike most gas – may limit the scope of trading somewhat. However, it is not likely to be a total barrier. Water can be, and is, blended before final delivery.

In addition, it seems highly likely that water trading would allow and indeed encourage sales of 'grey water' to and between industrial consumers through isolated pipes. This does exist on a limited scale but could probably be greatly extended which would reduce the demand for and pressure on drinking water quality resources.

There are various other issues that are important but these are more concerned with trading arrangements and licences which are discussed in the next section.

4. Licensing Issues in the Development of Water Competition in England & Wales

The main necessary change for water competition to develop on any scale is a transformation of water abstraction licences from administrative licences (like dog licences) to commercial, quasi-contractual franchise licences (like electricity generation licences or their gas equivalents). Currently, water supply companies have commercial licences of the latter type for all elements of their supply chain (distribution and sales) but not for water abstraction. In consequence, according to Ofwat, water abstraction accounts for only 12% of the E&W water supply value chain as opposed to 50% for the physical distribution network[13]. In England& Wales, abstraction and water treatment combined account for under 40% of water supply costs as opposed to over 60% for electricity generation. However, to some extent, these numbers are artifacts which arise because the EA cannot currently charge more than the licence administration cost.

The core suggestion of this paper is that abstraction licences be converted into long, fixed period licences (eg 25 years or more) where relatively tough limits are set on abstraction rates in water deficit areas, accompanied by high penalties on over-abstracting. The abstraction limits would need to be derived from water resource plans and Government or Environment Agency set limits based on environmental sustainability and would be specified in the licences, probably with periodic review procedures and clearly specified step-in rights for the Environment Agency. Note that there is a strong case for differential (higher) fees for water extraction in over-abstracted areas relative to over-licensed areas.

This model would then provide the basis for a major expansion of wholesale water trading. It would do this by providing a price for surplus water if traded which can then be compared with the costs of extracting additional water (or building more facilities for abstraction) in water deficit areas. Currently, given the very low levels of trade in bulk water, the possibilities for monetizing or pricing surplus water are extremely limited.

Of course, long duration abstraction licences would (as with other regulated industries) be open to revision and renegotiation at the initiative either of Environment Agency or the companies – provided that new conditions cannot be imposed on the companies by Environment Agency without their consent. This is, of course, the standard practice for all independent regulatory agencies, including Ofwat. Given the uncertainties over long periods, such procedures are necessary for any contractual or licence arrangements of the length proposed, let alone licences for water where available supplies are particularly uncertain given the potential impacts of climate change. In addition, it may be appropriate to design abstraction licences with specific features such as 'buyback prices' at which Environment Agency could repurchase water rights[14].

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[13] There are various reasons for the low value share of upstream water, including the fact that the Environment Agency can only charge an administrative cost for the abstracted water.

[14] In the climate change greenhouse gas emissions context, it has been suggested that governments or regulators set 'buyback' prices for CO2 permits to set a floor under prices.

Any such licensing framework would need to be introduced in the context of the current regulatory and planning arrangements for water abstraction. In particular, they would have to be designed in the context of River Basin Management Plans and contain the necessary safeguards to ensure that Environment Agency's conservation and other environmental obligations are met. However, since the Environment Agency is currently preparing a Water Resources Strategy, developing the type of water trading system and licensing framework discussed here could be very helpful for joining up ends and means in a strategic planning exercise of this type.

Moving towards such a system would:

- *Provide the basis for valuing water at the wholesale level*

  Deficit companies would face a marginal demand price for bulk water while surplus companies would have a market-based supply price at which they can sell. This would provide the basis for inter-company regional trade at market-based prices.

- *The bulk water prices thus revealed would be closely related to marginal costs, evaluated at the relevant abstraction limit*

  The prices would be a *family* of marginal costs from 1 day ahead to many years ahead, but anchored by the regulated retail price. (For water supply companies with a regulated retail price to small consumers, the maximum affordable wholesale price can be calculated on a netback basis[15].) These prices would be reflected in a series of contract prices for delivery at various periods ahead plus a spot market 'balancing' price for very short-term trading[16].

  Hence, assuming the abstraction rates were primarily determined by environmental objectives derived by water sustainability targets, the marginal costs and wholesale prices would fully include the impact of environmental externalities (sustainable extraction rates, quality, etc). This would allow for the tightening of environmental targets over time if EU and/or UK government policy moved in that direction.

- *The resulting term structure of marginal costs would give economically efficient signals both to excess demand and excess supply companies on shorter term extraction and usage through to long-run demand reducing or supply increasing investments.*

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15 A netback price for abstracted water would be the price for bulk water having deducted distribution and supply costs as well as water processing costs and all other costs incurred between the abstraction point and the retail consumer – who, in the model proposed above, would pay a regulated price. Netback prices are common in the oil industry for pricing crude oil from different countries and sources.

16 A short-term balancing market is crucial for gas and electricity. It would probably be needed for water but, may not be a priority given lesser needs for national system balance and some local accessible supplies and/or storage.

This would cover signals for network investment – particularly inter-area pipe connections – as well as local storage and investment to develop new water resources. This system would provide the appropriate revenues as well as signals for building interconnectors. The signals would include the impact of environmental targets via the internalisation of the environmental policy targets.

5. Transitional and Implementation Issues for Abstraction Licences

The key to a successful introduction of competition is having in place a sensible transitional approach and well-founded first steps. A well-designed transitional path is massively more important than any blueprint for a 10-20 year ahead target. This has been demonstrated by UK electricity and gas and by many other successful and failed infrastructure reforms around the world.

Opening up markets to competition gives rise to a process of discovery which produces many unexpected effects[17]. Provided the path to water competition is well-designed, there should be more beneficial than adverse unexpected effects. However, there will be some unanticipated and potentially damaging effects unleashed even in the best designed introduction of competition. It is essential that the Environment Agency and Ofwat have mechanisms in place by which these can be tackled effectively and quickly as soon as they arise.

In essence, most of the issues above relate to abstraction licences, including:

- The design of new licences that foster wholesale water trading;
- The transition path from current abstraction licences to commercial water trading licences ;
- The balance between stability and flexibility in licence rights – including 'step-in' rights for the Environment Agency and others; and
- Whether tradable water rights in new licences are assigned (e.g. 'grandfathering' on the basis of existing usage) or bid out by auction – or, most likely, what combination of assignment and bidding is optimal[18].

There are a number of other issues that are important and/or will emerge in discussion but, in what follows I focus on these. The fundamental problem is how to provide:

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[17] The importance of competition as a discovery process is the central theme in the recent RPI Report on developing competition in E&W water service provision.

[18] The issue of assignment versus tendering has become very important – and hotly debated - for carbon emissions with many economists strongly arguing for maximizing the use of auctions. Conversely, energy companies and large industrial energy consumer , not surprisingly, resist this and argue for 'grandfathering'. Similar issues arise over airport slot allocation.

(a) reasonably secure property rights in water; with
(b) adequate incentives to convert to new licences; while
(c) not allowing existing water companies with large amounts of unused supply capacity to gain large economic rents from trade.

These are difficult issues but are being increasingly successfully addressed in the climate change context e.g. by cap-and-trade models with growing use of auctions for the allocation of rights. It is assumed in what follows that EA would issue, monitor and enforce the new abstraction licences. However, they will also, for administrative and other reasons, require careful co-ordination with Ofwat and Defra.

On the *design* of abstraction licences, one model suggested by energy industry licences would be to have rolling 20 or 25 year water supply contracts where abstraction limits (along with other factors) were specified in the licence. The limits could then be changed either with the agreement of both Environment Agency and the licence holder or, where they disagreed, by some review/appeals agency. There would be no price controls so that the price of bulk water would be determined solely by negotiation between buyers and sellers of bulk water - as with electricity generation or wholesale supply licences or their gas equivalents[19].

Such licences would include the right to trade water between areas and possibly within river catchments. These trading rights would need to be subject to consideration of the scope for abstraction in one area to have a differential impact on the environment or on other water abstractors. For this reason, water trade within river catchments may well be more trade in abstraction rights and/or licences rather than trade in bulk water[20]. Such licences would also include provisions for takeover and merger controls, etc. There would also need to be provision for providing licences to new entrants – and probably simple licences for water traders and similar[21].

I assume that the Environment Agency would continue to set abstraction limits in the context of the framework set by UK and EU law. I would expect extensive consultation before any new limits for the coming 10-20 years were promulgated. Government targets, including climate change mitigation and adaptation targets would play an important role in setting new abstraction limits. There would also have to be a close relationship with water resource plans. Environment Agency would certainly have the core monitoring and enforcement responsibilities for managing abstraction limits.

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19 This is subject to there being no actual or potential abuse of dominance or monopoly power by buyers or sellers. This has been a significant problem in electricity generation markets but rather less so in wholesale gas markets, at least since the unbundling of British Gas. Environment Agency and Ofwat would need to have the appropriate competition monitoring and enforcement powers to provide effective competition oversight.

20 My interpretation is that the Murray Darling water basin in Australia operates more by trading water rights than by trading water.

21 The development of trade in financial rights to water, a balancing market and any development of futures or derivative markets would inevitably involve some degree of FSA oversight.

On *flexibility*, longer-run flexibility is provided by standard licence change procedures as outlined above. This provides a balance between reasonable flexibility and sufficient certainty as to support large-scale, long-lived investments.

Short-run flexibility (e.g. for emergencies including either flood or drought) is typically provided for by allowing the regulator to suspend market-rules and competition at times of defined emergency. This would need to be included both in licences and supporting legislation. Legislation or the licences define broadly what constitutes an emergency and the Environment Agency (or government) has to announce the start of the emergency and give reasons for it as well as how long emergency powers are requested for. This is standard in other industries and provides a reasonable balance between stability and flexibility in the face of uncertainty[22].

On the *allocation of rights*, the control of economic rents for companies with large volumes of low cost water points to the use of auctions rather than assigning the rights according to current usage (e.g. 'grandfathering'). However, auctioning of rights could also act as a disincentive to companies renegotiating their licences from the existing ones to the new ones. This is a very important issue in designing a credible transition path, which we deal with next.

In terms of designing a *transitional path*, the key issue is whether the existing abstraction licence holding companies are to be encouraged to adopt the licences on a voluntary basis or whether , to a greater or lesser extent, they are to be forced into it. If possible, a voluntary transition is probably preferable – and may be encouraged by the potential gains from trade. These gains would accrue both to water-short and water surplus companies provide that abstraction limits were tight, strongly enforced and that there were sufficiently high penalties for breaches. But, this raises the potential problem of monopoly rents to companies with large water surpluses which they can sell at relatively low marginal cost. It may be that the cost of building more interconnection would alleviate or even remove the economic rent issue but this is not clear – and it may, in any event just postpone the problem.

In principle, there are many ways in which, either by legislation or by regulatory action, companies can be pushed towards or even compelled to take up the new licences. However, commercial viability, human rights legislation and general good regulatory practice all suggest that companies will at least need to be compensated for any losses from moving to new licence arrangements. More may be required e.g. a good expectation of reasonable earnings from developing water trade.

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22 It may be argued that water 'emergencies' from drought can be longer lasting and present chronic rather than acute supply problems as found in the energy industries. However, this is not obvious. The most appropriate analogy may be with high electricity prices from low hydro generation lasting several months or sustained high gas prices as we saw in 2006-8. In addition, supply disruptions from floods are genuine and short-term supply interruptions whose impact on the quantity and quality of water supplies is typically relatively short-lived.

All of the above will, of course, need to be developed while retaining strong control over retail water prices, particularly to households. A major issue here will be whether and how far retail price differences will be allowed between areas and regions. However, one obvious issue is that commercialising the supply of bulk water will significantly change the water value (and cost) chain and the more so the bigger the environmentally targeted limits on water abstraction. This raises major and highly political issues and will require close co-ordination by Environment Agency both with Ofwat and Defra.

6. Conclusions and Further Work

The main conclusions were given in Section 1 and do not need to be repeated here. The fundamental point is that it is possible to postulate a credible approach for developing wholesale competition in bulk water supply in England and Wales that draws on models that have been successfully applied in the energy sector, provided that it is combined with incorporating the wider environmental costs to society. This would require trade in bulk water (or water abstraction licences/rights) to be based on prices that internalised environmental externalities.

In consequence, the approach proposed is based on a reform of abstraction licences that would encourage water trading with and between areas/regions. If successful, it could be expected to provide substantial environmental and consumer benefits. Hence, the proposed way forward for England & Wales upstream water arrangements is based on experience over the last 15-20 years in UK and EU gas and electricity markets but drawing considerably on the 'cap-and-trade' model now in place for reducing UK and EU Greenhouse Gas emissions.

However, although the model looks credible, there is much that needs to be looked at in detail to establish whether or not its potential can be expected to be fulfilled. There are a number of important questions about the initial steps on how the process would be started off as well as medium and long term objectives. In particular, there is a very clear need for quantitative modelling to test whether the expected effects, based on energy industry reform paths, can realistically be expected to arise in the E&W water supply context. Simulations using the Environment Agency's WRSE (Water Resources in the South East) model may well provide a useful starting point both in general and (as suggested below) for designing some early experiments.

On the basis of this paper, I would suggest that the most obvious areas where further work is needed are:

1) *Whether or not (a) the volume and pattern of water resource deficits and surpluses in England and Wales; and (b) the current degree of inter-area network interconnection is sufficient to support the initial development of a wholesale 'swaps-based' trading structure for bulk water.*

   To investigate this will require the collection of the relevant data and considerable statistical modelling as well as further thought

2) *How abstraction limits to be set in licences should be determined , allocated and, if necessary, changed for environmental or other reasons.*

   This includes issues such as (a) the costs and benefits of tighter and looser limits as well as (b) the relative roles of allocation of rights as opposed to their auctioning. The work done on modelling climate change polices and emissions allocations should be helpful here.

   Note that as with EU greenhouse gas emission limits, the best solutions may well involve initial 5-year or similar periods with provisional arrangements which are revised in the light of experience.

3) *Processes and procedures for moving from the current administrative abstraction licences to more commercial ones.*

   This seems to be the key transitional issue on how to start off the proposed process. It may be that the gains from trade are sufficient to set off a chain by which increasing numbers of licence holders are willing to switch to (say) 25 year rolling commercialised but tradable licensed franchises. But, this is not obvious and may conflict with auctioning licence rights. In that case, the question arises as to what combination of incentives and compulsion is necessary and how it might best be achieved.

4) *What the environmental benefits would be from a move to wholesale competition with limited abstraction rights and what would be the implications for retail prices, particularly household water prices.*

   This is the crunch trade-off. The Environment Agency and others need to be clear about the benefits and costs of different levels of abstraction limits – paths over time not just a limit ant any specified date. There are the environmental benefits (and any costs) plus the competition costs and benefits to consumers.

   To be economically, socially and politically acceptable, any move to the type of framework proposed in this paper will have to avoid major hikes in costs (e.g. investment costs) - and also in prices to consumers, particularly household consumers.

   To estimate these will require extensive Impact Analysis appraisal work and quantitative modelling.

Finally, there is no alternative to practical experience and, perhaps the most important issue is that there seem to be virtually no examples of liberalising water reform anywhere in the world. Unlike the UK electricity and gas reforms of the 1980s and 90s, there is no evidence from elsewhere as to what works and what doesn't for water competition, upstream or downstream.

That in itself strongly suggests taking an experimental approach where one or more options are tried in different areas.

An additional reason for an experimental approach to water competition design in England and Wales is that there is no obvious prima facie reason why market structures need be the same across the country. They do need to be the same for electricity and gas with national single transport/transmission facilities, but water has never been provided on a national basis. It has been – and is likely to continue to be – provided by local or regional companies with water drawn from river basins with different characteristics. Experiments will allow an investigation of different models and/or model variants to establish what works best, where and why.

In consequence, one obvious possibility may be to work towards an early experiment with abstraction rights trading on the lines suggested, for instance, in East Anglia or South East England. This could be designed in the light of analysis of the Environment Agency model of water availability and interconnection in the South-East. But, other areas (e.g. in the Midlands) may also be willing to offer experiments.

The wide range of experience in energy and telecom market liberalisation and competition arrangements (as well as its long and continuing evolution) greatly support the case that there is no blueprint for introducing competition into water markets in England and Wales. Indeed, it seems much less likely for water than the other industries that a uniform national model would be the best choice even for England alone. In addition, any model – or experiments – in water must integrate growth in competition with effective management of the environmental challenges that are already present in water stressed areas.

Fortunately, as argued in this paper, the introduction of effective environmental signals via a 'cap-and-trade' approach to abstraction limits fits very well with increased competition and, indeed, may foster upstream bulk water competition by helping value surplus water supplies. This is what I would suggest should be the main hypothesis to be tested in further modelling, experiments and policy design in this area.

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ANNEX 1

SINGLE BUYER MODELS IN ENERGY AND THEIR LESSONS FOR ENGLAND AND WALES WATER REFORM

A General Comments

1. *Single buyer (SB) models, better described as collective purchasing agency models, come in various guises.*

    - They can be national, regional or local.
    - They can be mandatory monopolies or voluntary group buying and/or selling arrangements
    - They may own the electricity supplied or not (e.g acting as a broker or load aggregator)
    - They may buy wholesale electricity on long or short term contracts or via auctions.

    Most importantly, single buyers can be vertically integrated with upstream generation or separated from it (e.g. owned by the transmission company or by the State).

    For further details see Arizu, Gencer and Maurer (1986)

    NOTE: Almost all SB-related discussion is about electricity but the same issues arise in gas. In what follows, I will also focus primarily on electricity.

2. *The standard single buyer model is a national mandatory wholesale single buyer and seller.* The most usually observed case is that the single buyer is part of a national company with vertically integrated generation and transmission but with more than one retail distribution company and typically with IPP generators selling via the single buyer. This model is often known as the Asian IPP model. The vertically integrated generation plus transmission model is also the most problematic as well as the most widely used SB variant in practice.

    The main alternative to the bundled single buyer is where the single buyer is attached to an unbundled transmission company. That was the initial Northern Ireland electricity model but it was dropped after a few years for bilateral trading between generators and retail supply companies.

    There are various reasons (good and bad) as to why the unbundled SB model is rarely found in practice. The bad reasons are usually to do with the desire of companies and or governments to preserve 'national champion' utilities and to bring in limited generation competition without wider or deeper reform. The good reasons are that transmission

companies rarely have sufficient assets or revenues with which to back contracts with both generators and retailers.

3. *The practical disadvantages of the 'standard' SB model as found in practice are*

    a) Failure of SBs to be good buyers e.g. planning more capacity and signing more generation Power Purchase Agreements (PPAs) than necessary;
    b) Lack of transparency (e.g. via non-bid PPAs, confidential PPAs);
    c) Rigid contractual and institutional arrangements that adversely affect the possibilities for further liberalisation (e.g. take-or-pay generation contracts, inability to modify PPAs to extend wholesale competition without creating major stranded asset problems.);
    d) Creation of long-term contingent liabilities (mainly a developing country problem but not always viz. post reform crisis California); and
    e) Inability to eliminate risks for developers (upstream investors still face risk arising from credit-worthiness of SB).

    (Source: Arizu, Gencer and Maurer.)

    Kessides (2004) adds the following to this list:

    f) Strong discouragement of upstream entry into generation – and, to a lesser extent, of availability and supply by new entry generators.
    g) Disincentives on retail supply companies to develop demand forecasting and procurement processes.

    Of the problems identified above, a), c) and f) are particularly important and damaging. In addition, these problems would presumably apply to a national SB or regional SBs for E&W water.

    In general, the mandatory 'classic' SB model is wholly inimical to new upstream entry. For water, this could be particularly damaging if there were real prospects of increased bulk water supply – and trade – from non-river groundwater sources.

4. *In OECD countries, the 'standard' SB model has consistently rejected for both electricity and gas by governments, not least for the problems set out above.*

    - The SB model with tendered generation was (at the insistence of France and its allies) made an option in the 1st EU Electricity Directive 1996. However, neither France nor any other EU country adopted it.

- Before mandatory retail competition, Germany and Austria had local SBs for electricity and gas (Municipal Stadtwerke in Germany and, in Austria post -1997, non-mandatory regional and municipal aggregator/brokers).)

- Central European (CE) countries adopted 'standard' SB models for electricity after 1989 so that the future expected revenues from PPAs could be used as collateral for refurbishing rundown generation. This caused major stranded asset problems when the CE countries had to introduce retail competition on joining the EU. But, there seems to be no desire to return to SBs by any of the CE EU acceding countries.

- In the US, there are various voluntary collective purchase and brokering arrangements (e.g. in New Jersey) but, as far as I know, no 'standard' SB other than the disastrous post-crisis California example.

B Implications for England & Wales Water Reform

1. The main problems with mandatory electricity SBs are highly likely to be present in water reform. In particular, the standard, bundled SB model would very probably kill-off any real prospect of increased upstream entry into the bulk water market. Given the difficult water supply prospects in the South-East, that seems a very dangerous choice.

2. If the SB model were intended as an interim model for water, great care would have to be taken to introduce provisions that would allow for future liberalisation, upstream and for retail markets. It is very difficult indeed to combine the flexibility for future liberalisation with sufficient security to support new investment. Major stranded asset contract problems would be difficult to avoid.

3. The alternative SB framework would require considerable business/ownership separation within water companies - which raises the inevitable questions about sufficient assets and revenues to provide sufficient contract backing.

4. Non-mandatory collective purchasing agreements and the use of auctions of water (as used in electricity e.g. in France and New Jersey among others) could be promising. Also, maintaining a retail monopoly on small customer water sales would encourage this de facto. Indeed, retail competition but retaining tightly regulated household prices typically leads to a very similar outcome (viz. France, Belgium and most US states where very few consumers have switched away from incumbents).

5. In energy – and probably in water – effective upstream competition has been the prior requirement for retail competition with large consumers leading the demand for retail competition and (probably) rather smaller benefits from retail competition from households.

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