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Assessment of regulatory barriers and constraints to effective interconnectivity of water supplies

R&D Technical Report WT0921/TR

Produced: September 2010

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Statement of use
This report is part of Defra's Water Availability and Quality Research Programme. Its overarching objective is to identify potential barriers to prospective regulatory or planning regimes in support of inter-basin transfers and to provide an objective assessment of their implications in order that legitimate options for inter-basin transfers are not artificially constrained.

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Executive Summary

Interconnectivity through the bulk transfer of treated water and sharing of resource capacity is one of a number of resource options available to the water industry for consideration in its supply planning. Where it is cost-effective to do so, interconnectivity can provide a number of benefits:

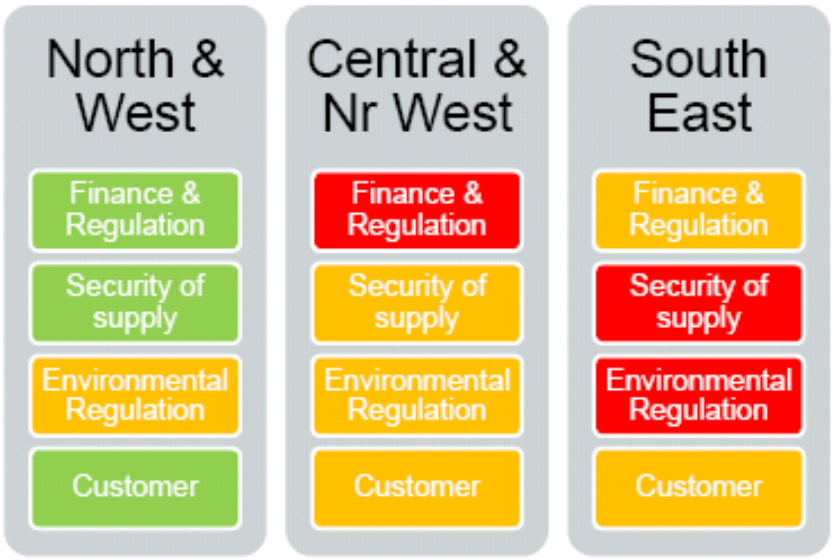
- Avoiding or deferring the need to build major new assets, reducing costs to customers.
- Providing revenue benefits to shareholders and customers from selling surplus supplies available from existing resources.
- Addressing water scarcity, leaving more water in the environment in those areas where abstraction may already be at or beyond sustainable limits.
- Improving the resilience of water services to respond to droughts or other interruptions to supply.
- Encouraging innovation and incentivising efficiencies and in water services.

This report provides an evidenced and objective risk-based assessment of the potential barriers and constraints imposed by the current regulatory and planning regimes to the development and implementation of interconnectivity and sharing of water resources in England. It provides a high level assessment of potential options to mitigate the perceived or actual risks identified which could be used to support strategic water management planning processes. This report provides a strategic assessment of the effects of regulatory framework and the manner in which it is being applied based on consultation and engagement with industry practitioners; it is not intended to provide a detailed assessment of interconnectivity.

Drawing on consultation with stakeholders from across the industry, the report provides an assessment of:

- How and where barriers are perceived to arise.
- Where there are significant constraints.
- Where there are gaps – in the manner in which the regulatory framework is implemented by the regulatory agencies – and where potential opportunities for change may arise.

The four critical barriers and constraints identified during consultation and their perceived importance are summarised by region in the figure below:



This is not intended to reflect the relative importance of any one aspect over another to a water company, rather our interpretation of companies' views expressed through consultation of the extent to which these issues impose greater (red) or lesser (green) barriers and constraints to interconnectivity and resource sharing. This emphasises strong regional concerns, particularly around companies' security of supply and environmental obligations which places significant constraints on companies' decision making. The critical constraints and opportunities for mitigation identified through consultation are:

Constraints:

- Lack of return for the company taking the bulk supply and truncated returns for the company providing the bulk supply.
- Company taking the bulk supply would be penalised under current regulations (Opex efficiency) for what are uncontrollable costs.
- Increased risk to security of supply obligations from lack of direct control over the activities of the donor water company and provision of reliable supplies.
- Future licence uncertainty with respect to the National Environment Programme and impact of proposals for time limiting all licences.
- Visibility / transparency of supply costs and availability.
- Inadequate valuation of true cost of water, reflecting water scarcity, limits incentives to trade or transfer.
- Carbon Reduction Commitment (CRC) cost burden on suppliers through Ofwat interpretation of pass through; donor subsidises the carbon costs of water demand by the receiving company.

Opportunities for mitigation:

- Review of price cap, taking Capex and Opex costs associated with bulk supplies out of the price review process to allow companies engaged in interconnectivity schemes to jointly benefit and provide incentives to trade and share resources.
- Rebalance Opex and Capex incentives within the regulatory regime:
  - Enable return on investment in bulk supplies;
  - Remove all or part of the operating cost associated with the bulk supply from the efficiency assessment.
- Reduce uncertainty with respect to licence reduction through sustainability reductions and other regulatory measures.
- Seek opportunities through model agreements or other measures to align and improve visibility / transparency of the following in the donor/recipient zones:
  - Levels of service.
  - Management of risk.
  - Operational and capital maintenance requirements.
  - Supply costs and resource availability.
- Develop approach to scarcity pricing to provide economic incentives to identify where inter-catchment water transfer might provide more efficient options.
- Review CRC guidance to companies and avoid unintended consequences on donor companies.
- Develop model case studies of trading to demonstrate requirements and benefits.

A range of potential options have been identified to mitigate those barriers and constraints considered significant by stakeholders. There is no simple either / or solution set; the balance and merits of measures that rely on duties or incentives will need to be considered carefully. From our analysis and consultation with stakeholders, the following conclusions can be drawn:

- The more barriers can be removed, the better; in particular, removal of current financial barriers.
- Incentives could result in cost to customers but overall are likely to be more effective than increasing regulation.
- Better transparency of resource requirements, availability and costs is essential. A number of options have been identified:

- Publication of AISCs of the next scheme required in each resource zone early in the timetable of the next planning round.
- A requirement on companies (through the WRMP process) to formally consult with neighbouring companies and to report on that as part of the early development of companies' WRMPs.
- Acknowledging the full process may be commercially sensitive, encouraging companies to invite costed expressions of interest to supply.

- Companies' security of supply obligations need to be clarified to confirm where potential business risks from interconnectivity schemes may occur. Ofwat's use of the security of supply index (SOSI) as a potential barrier should also be carefully reviewed.
- The issue of interconnectivity raises a more fundamental question around levels of service and whether there would be benefit from application of consistent standards across the industry rather than base reference standards chosen by each company independently.
- Development of a Model Agreement for interconnectivity schemes may provide a sounder basis to promote discussion and development of schemes.
- Building trust and confidence between all stakeholders is crucial; regulators will need to provide an effective lead, encouraging transparency and providing greater clarity around abstraction licence uncertainties created by the National Environment Programme. Other issues referred above will provide a sounder framework for engagement between companies.

Moving forward, it will be important to assess potential for unintended consequences of any option, particularly in relation to changes to legislation, Directions and Guidance which may inadvertently create new barriers to interconnectivity.

Glossary

Average Incremental Social Cost (AISC) - of a scheme is calculated by dividing the net present value of scheme costs by its discounted contribution to balancing supply and demand.

British Waterways (BW) - the public corporation that cares for the 2,200-mile network of canals and rivers in England, Scotland and Wales.

Bulk supply (BS) – supply of water (treated or raw) made from one company to another under agreement. These supplies are often traded under long-term contracts and on non-standard terms.

Catchment Abstraction Management Strategy (CAMS) – Sets out how the Environment Agency will manage water resources within catchment areas.

Capex – capital expenditure; appointed water companies' spending on new, replacement or refurbished capital assets, such as construction and buying machinery.

Carbon Reduction Commitment – known as the CRC Energy Efficiency Scheme, is the Government's mandatory climate change and energy saving scheme aimed at improving energy efficiency and cutting emissions in large public and private sector organisations.

Consumer Council for Water (CC Water) - represents water and sewerage consumers in England and Wales.

Deployable Output (DO) - The output of a commissioned source or group of sources, or of bulk supply, as constrained by:

- environment;
- licence, if applicable;
- pumping plant and/or well/aquifer properties;
- raw water mains and/or aquifers;
- transfer and/or output main;
- treatment;
- water quality.

Drinking Water Inspectorate (DWI) - provides independent reassurance that water supplies in England and Wales are safe and drinking water quality is acceptable to consumers.

Environment Agency - is the environmental regulator of the water and sewerage sectors in England and Wales.

Headroom - (Target Headroom) - describes the minimum buffer that a prudent water company should allow between supply (including raw water imports and excluding raw water exports) and demand to cater for specified uncertainties (except for those due to outages) in the overall supply/demand balance.

Interconnectivity - infrastructure schemes which enable more effective use of available water resources between water resource zones (WRZ), typically

including bulk supplies or strategic transfers of water (treated or raw) or inter-basin transfers of raw water.

Joint venture (JV) - a legal entity formed between two or more parties to undertake an economic activity together, in this case, investment in water resources or supply schemes.

Levels of service (LoS) - Specific measures of services to consumers; for example, referring to the frequency of imposition of restrictions on water use by customers (e.g. hosepipe restrictions).

Megalitre (Ml) – one thousand cubic meters, or one million litres.

National Environment Programme (NEP) – 5 yearly programme setting out environmental improvement obligations for water companies.

Ofwat (The Water Services Regulation Authority) - is the economic regulator of the water and sewerage sectors in England and Wales.

Opex (Operating expenditure) – appointed water companies' day-to-day spending on running the services, for example, staff costs and power.

Periodic Review (PR) – PR04 Periodic Review 2004, PR09 Periodic Review 2009, etc.

Price cap - the annual increase in charges that appointed water companies can make, controlled by the price limit formula RPI ± K + U.

Price review - the process of re-setting appointed water companies' price limits.

Regulatory capital value (RCV) - the capital base used in setting price limits. The value of the regulated business which earns a return on investment.

Restoring Sustainable Abstraction (RSA) Programme - set up by the Environment Agency in 1999 to identify and catalogue those sites which may be at risk from abstraction and that provides a way of prioritising and progressively examining and resolving these concerns.

Return on capital: A financial measure that quantifies how well a company generates cash flow relative to the capital it has invested in the business.

River Basin Management Plan (RBMP) – plans detailing programmes of measures to deliver good ecological status under the EU Water Framework Directive.

Security and Emergency Measures Direction 1998 (SEMD) - requires water companies to ensure that they have the capability of supplying water by alternative means should piped supply fail.

Security of supply (SoS) – assessment of a water company's ability to supply its customers in dry years without imposing demand restrictions such as hosepipe bans.

Security of supply index (SoSI) - assesses each appointed water company's ability to supply customers in dry years without imposing demand restrictions such as hosepipe bans. Companies with higher index score bands have better security of supply.

Shadow price - the theoretical maximum price that a company would be willing to pay for an additional unit of a given limited resource.

Special purchase vehicle (SPV) - a legal entity (usually a limited company or, sometimes, a limited partnership) created to manage investment in specific projects and isolate the parent companies from financial risk.

Strategic Direction Statement (SDS) – required for the first time for PR09. The SDS sets out a water undertakers long-term objectives, and it plans to achieve them.

Sustainability Reductions – the reductions in licensed abstraction to meet the environmental obligations on companies as set out in the National Environmental Programme.

Upstream markets – those aspects of water services that are upstream of retail of water to consumers i.e. water resources management, treatment and distribution.

Water Framework Directive (WFD) - established a new, integrated approach to the protection, improvement and sustainable use of Europe's rivers, lakes, estuaries, coastal waters and groundwater.

Water Industry Act 1991 (WIA).

Water Resources in the South East (WRSE) group – comprising the South East region's water supply companies, Ofwat, and the Environment Agency.

Water Resources Management Plan (WRMP) – statutory reporting requirement on water companies concerning how they intend to manage supplies and demand for the forthcoming 25 year period.

Water Resource Planning Guideline (WRPG) - prepared by the Environment Agency - provides a framework for water companies to follow to develop and present their WRMP.

Water resource zones (WRZ) - as defined by the Environment Agency's Water Resources Management Plan Guidance. The largest possible zone in which all water resources, including external transfers, can be shared. Hence, it is the zone in which all customers experience the same risk of supply failure from a resource shortfall.

Water scarcity charge – theoretical levy introduced in catchments to restore sustainable abstraction and deliver environmental improvement.

Introduction

Background and context

Interconnectivity through the bulk transfer of treated water and sharing of resource capacity is one of a number of resource options available to the water industry for consideration in its supply planning. Where it is cost-effective to do so, interconnectivity can provide a number of benefits:

- Avoiding or deferring the need to build new assets (e.g. reservoirs, run-of-river abstractions, groundwater sources or water treatment works) to meet demand, avoiding the social and environmental impacts of new schemes and reducing costs to customers.
- Revenue benefits to shareholders and customers from selling otherwise surplus supplies to other companies available from existing resources.
- Addressing water scarcity by leaving more water in the environment in those areas where abstraction may already be at or beyond sustainable limits.
- Improving the resilience of water services to respond to droughts or other interruptions to supply.

Ofwat (2010a) also point to interconnectivity being key to competitive markets, providing incentives for more efficient operation and innovation in providing new water services.

The scope for inter-company / inter-basin transfer of water to support security of supply is a key feature across many company water resources management plans (WRMP) submitted to Defra. The WRMP process requires consideration of the supply and demand balance under specific design conditions of high demands triggered by periods of hot dry weather and low water resource availability. Under more benign conditions more water may be available for transfers, but the transfers may not be needed. The WRMP process is set out in the Environment Agency (the Agency) Water Resource Planning Guideline (WRPG) and Ofwat's reporting requirements for the Periodic Review and June Returns

Of the range identified in final WRMPs, potential schemes include:

- Transfer schemes identified through Water Resources in the South East (WRSE).
- Transfers (of various scales) from the River Severn into the Thames Region.
- Transfers from Wales to Thames Region (e.g. the Columbus transfer from South Wales).
- Transfers via the British Waterways (BW) canal network (e.g. via the Oxford Canal into Thames Region).

- Enhanced transfers across East Anglia into the South East (e.g. into the Home Counties to the North and East of London).

These build on transfer and bulk supply arrangements that are already in place to a greater or lesser extent across the country. Larger scale interconnectivity, such as a national water grid has been shown to be infeasible as a result of high costs and high energy and carbon intensity (Environment Agency, 2006). Nevertheless, there are regional opportunities to build on the existing framework, providing greater connectivity between neighbouring water companies and regions to improve supply-demand resilience (House of Lords, 2006; Cave Review, 2009). However, the House of Lords (op cit) refers to there being a "*reluctance amongst separate (and competing, to an extent) water companies to co-operate*". Stakeholders have highlighted a range of barriers and disincentives within the current regulatory and planning regimes to companies to invest in interconnectivity schemes.

Within the WRMPs, options to maintain the supply demand balance are typically assessed in terms of: supply reliability, technical feasibility, environmental impact and sustainability, and cost-benefit (assessing financial, social and environmental costs of schemes). A number of interconnectivity schemes have been rejected by companies on the basis of their environmental impact and / or technical feasibility; such as water quality impacts, either within the natural environment, or as a result of mixing different quality water in supply. Other schemes taken forward, under the specific design conditions for which the supply demand balance is at risk, have subsequently been shown to be either costly compared to other options or have uncertain reliability. This latter point is important, especially in the context of the obligation of 'supplier of the last resort' on companies, which can effectively render a transfer / bulk supply option as infeasible due to the incumbent's legal obligations to its own geographic customer base. Ownership (shared) and / or the strength of legal rights to a particular supply will clearly influence this consideration. Schemes considered by Sutton & East Surrey (SESW) and South East Water (SEW) have been judged to be too costly and unreliable to dry year requirements compared with other options; SEW also indicate that modelling undertaken for WRSE has not considered the full economic cost of potential schemes.

By contrast, Ofwat (2010b) have suggested that the current value of water as reflected in companies' options assessments may not reflect the true value of water. Cave (op cit) refers to a potential scarcity charge providing an incentive to exploit differences in water availability through the pricing of water which could optimise water resources management within and between companies. This may help overcome barriers to trading; commentators typically refer to: hoarding for uncertainty, the reduction of rights at the point of trade, the complexities of the trading process and access pricing. The Environment Agency has also been criticised for not making full use of its powers to re-allocate water resources and

require operating agreements. Abstraction licences have historically been allocated on a first come, first served basis and Catchment Abstraction Management Strategy (CAMS) availability status ignores current water resources allocation, so does not facilitate trading of supplies or licences to address zones with a supply-demand deficit.

There is therefore a clear need for a comprehensive and objective review of the barriers and disincentives (perceived or actual) that exist within the current regulatory and planning regimes for water supply.

Aims and objectives

The overriding aim of this report is to provide an evidenced and objective, risk-based assessment of the potential barriers and constraints imposed by the current regulatory or planning regimes to the development and implementation of interconnectivity of water resources through inter-company / inter-basin transfers of water in England. Although the report is focussed on the regulatory and planning regimes, the report also discussed engineering and other practical issues that are seen as potential constraints. Whilst the report draws extensively from recent and current water resource planning practice, it has also been informed by the views of regulation practitioners and company reporters.

The report also provides a high level assessment of potential options to mitigate the perceived or actual risks in relation to the operation of potential inter-company and inter-basin transfer schemes in England, which could be used to support strategic water management planning processes.

This report is not intended to provide a detailed assessment of interconnectivity but, within the timescale available, to provide a strategic assessment of the effects of the regulatory framework and the manner in which it is being applied based on consultation and engagement with industry practitioners.

The study has been limited in geographic extent to consideration of the situation within England only.

What is meant by interconnectivity

The term “interconnectivity” is used here to describe infrastructure schemes which enable more effective use of available water resources between water resource zones (WRZ) as defined by the WRPG, particularly between WRZs managed by different water undertakers. Typically, interconnectivity schemes might include:

- Bulk supplies: transferring treated water from one undertakers’ supply area into that of another.
- Strategic transfers (either raw or treated water) from jointly owned resource schemes, such as strategic reservoirs.

- Inter-basin transfers: where raw water is moved from one resource zone to another via augmentation of river and canal networks.

Table 0.1– Bulk Supplies (Taken from Ofwat Bulk Supply Register)

	2007-2008 (m3)		2007-2008 (Ml/d)	
Company	**Imports**	**Exports**	**Imports**	**Exports**
Anglian	1,437,807	15,088,834	3.9	41.3
Bristol	392,774	1,353,472	1.1	3.7
BWHW	95,160	147,873	0.3	0.4
Cambridge Water	16,949	44,936	0.0	0.1
Dee Valley	26,280	17,934	0.1	0.0
FDWS	715,563	3,395	2.0	0.0
Essex & Suffolk	32,071,626	1,351,122	87.9	3.7
Portsmouth	0	466,811	0.0	1.3
SESW	0	18,610	0.0	0.1
South East Water	13,384,185	100,010	36.7	0.3
South Staffs	9,671	14,099,775	0.0	38.6
Severn Trent	137,994,928	23,665,588	378.1	64.8
Southern Water	1,682,411	10,646,172	4.6	29.2
South West Water	19,149	16,639	0.1	0.0
Thames	222,983	33,608,875	0.6	92.1
Three Valleys	10,355,355	8,077,620	28.4	22.1
UU	220,295	7,859,837	0.6	21.5
Welsh Water	10,372,752	125,236,066	28.4	343.1
Wessex	2,213,177	618,205	6.1	1.7
Yorkshire	21,132,066	86,074	57.9	0.2
	232,363,132	242,507,847	636.6	664.4
% of Total distribution input		4.40%		

Bulk supply schemes between companies currently supply 4.4% of the total water supplied by companies (Table 1.1). This quantity has remained static for some time; many of the agreements predate privatisation of the industry in 1989.

Approach

The focus of our approach to this study is summarised in Figure 1.1, which sets out a conceptual framework of the key agents within the regulatory environment which may present barriers to inter-company, intra-company and/or inter-basin interconnectivity either directly or indirectly as a result of the manner in which they are implemented.

The conceptual framework focuses on financial regulation and incentives to companies, the availability and transparency of information upon which companies may make decisions, the current regulatory powers available, and alternative business models. It provides a basis for assessing:

- How and where barriers are perceived to arise.
- Where there are significant constraints.
- Where there are gaps – in the manner in which the regulatory framework is implemented by the regulatory agencies – and where potential opportunities for change may arise.

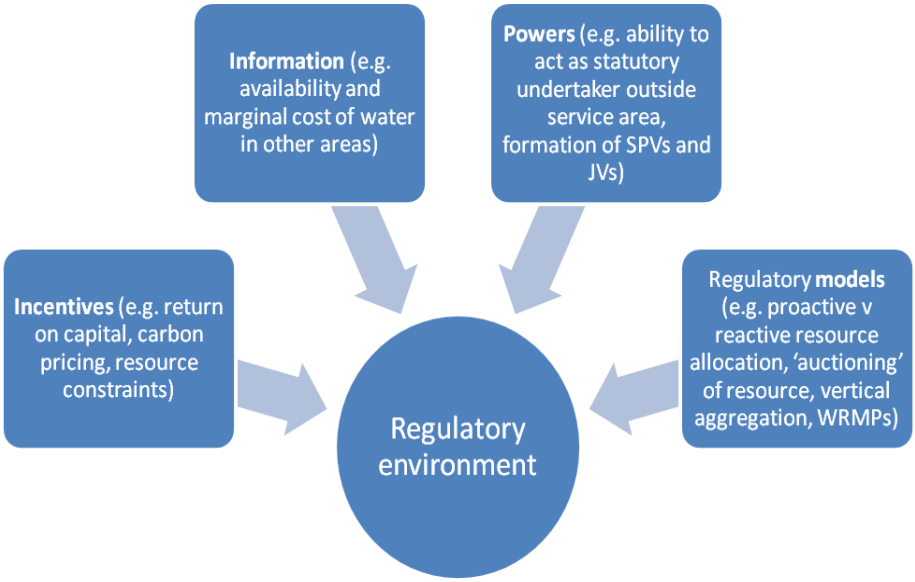


Figure 0.1 – Key agents within the regulatory environment

Our approach consisted of 4 key Tasks:

- **Initial review**: of key issues and positions adopted by companies to identify the extent to which barriers have been recognised.
- **Consultation**: with the industry to gain first hand evidence of the significance and impact of any barriers and constraints identified; the extent of opportunity; gaps in the regulatory approach and potential opportunities to vary the regulatory regime to provide greater incentives to companies where interconnectivity schemes are currently less favourable.
- **Identification of barriers and mitigation**: assessment of the extent and materiality of identified barriers and constraints to current decision making to identify potential mitigation measures.
- **Testing mitigation options**: to assess those actions that are deliverable with the existing regime, where the existing regulations may require new guidance or directions, where legislative change may be required and the implications for businesses.

The initial review has focussed on assessment of current plans to identify the approaches taken, and assumption made, by companies in short-listing schemes for their WRMPs and the extent to which regulatory and planning constraints have been explicitly recognised. The initial review provided an assessment of significance, perception (and type) of business risk, and impact (on decision making to date) to identify key issues for more detailed discussion with stakeholders, and to begin to identify the nature of potential mitigation options to be taken forward for testing toward the development of guidance. Key sources of information included:

- House of Lords 8th Report (2006).
- Cave Review (2009).
- WRMPs (2009).
- Business Plans (2009).
- Companies' Strategic Direction Statements.
- Current regulatory and planning guidance, relevant policy and legislation.
- Draft and Final Determinations for the Periodic Review.
- Stakeholder representations / consultations by Defra, EA and Ofwat.
- Publications by companies on aspects of competition of relevance to interconnectivity.

The project has consulted with stakeholders from across the industry, including representatives on behalf of all the water undertakers in England, Ofwat, the Environment Agency and Consumer Council for Water. The primary aim of consulting the industry was to draw out evidence on where the industry perceives there to be regulatory and / or planning barriers to more effective use of water resources through interconnectivity schemes; where there are counterproductive regulatory, planning or funding mechanisms in place; and, where the industry from its various perspectives sees potential opportunities to move forward. For example:

- The regulatory model bias toward (ownership of) capital schemes.
- The view that companies will suffer efficiency penalties when buying in water.
- Confidence in the concept of trading; economics are not fully tested.
- Where the environmental regulator imposes constraints (through licensing / CAMS etc) and could play a more proactive role (through trading or addressing environmental value).

- The extent to which companies have access to, and understanding of, economic costs of water in neighbouring company resource zones.
- Supplier of last resort requirements and extent of risk in reliance on transfer schemes.
- The regulatory incentives facing potential 'donors' and 'recipients' in terms of security of supply and level of service performance, particularly during times of drought when customer restrictions may be part of the operational/management response.
- Understanding carbon and sustainability limitations on transfer capacity.
- Practical constraints such as quality and customer perception (taste etc).
- Opportunities to change the regulatory model.

Consultation has also identified where transfer systems already operate effectively on an inter-company, inter-basin and intra-company basis (e.g. Veolia / Anglian, Thames / Sutton & East Surrey / Veolia etc, Wessex / South West, Southern / South East etc.).

Drawing on the outcomes of the consultation, the project aims to provide a strategic assessment of the range of barriers and constraints identified, the nature of the perceived risks and their significance and the impact on decision making to identify potential mitigation options and the extent to which options face different challenges or require different solutions. This also provides a basis to assess gaps in approach; for example, where approaches or models have been identified but have not been considered to date within the industry planning processes and / or where the current regulatory and planning regimes do not support the industry in adopting or developing them. For example:

- Potential vertical disaggregation of the industry: has been argued for some time and there are practical examples in the USA to draw experience from. To what extent does the current regulatory regime in England and Wales support that approach? What is the extent of benefits that could be provided? What further changes to the environmental regulations might be required to realise the potential benefits?
- Is there a need to consider alternative investment models, joint venture or special procurement vehicles?
- To what extent does the industry have transparent information available to it of the marginal cost of water supplies in different resource zones? How easily could that be resolved and what are the commercial risks, if any? To what extent can the Environment Agency play a more proactive role in providing information about resource availability that would facilitate effective trading and redress environmental sustainability issues in the process?
- How could a trading or auction process require allowance for environmental improvement e.g. through trading of unsustainable licence quantities?

Focussing on those aspects having greatest significance / impact on decision making in supply – demand planning, the project aims to prioritise those aspects where potential mitigation might yield the greatest benefit, to assess the practicalities of those measures identified and the implications for change to the current regulatory and planning frameworks and in relation to the ease or difficulty (and potential cost) of implementation.

Notwithstanding that there will be circumstances where because of cost, carbon and / or engineering feasibility, interconnectivity schemes may not be cost effective, this project aims to identify:

- What can be done more effectively now, within current regulatory, planning and funding regimes?
- Where guidance and directions are needed to the regulators and to the industry to make more effective use of the existing legislation and regulatory frameworks.
- Where the current business and / or regulatory models need changing and the extent of the benefits that may be realised.
- Where legislation may need to be changed to more effectively facilitate transfer and trading of water.

Current Regulatory Framework

Security of supply

Water undertakers have a statutory duty under section 37(1) of the Water Industry Act 1991 ('the WIA 1991') to *"… develop and maintain an efficient and economical system of water supply… "* within their supply area and to make arrangements necessary to ensure that they are able and continue to be able to meet their obligations under Part III of the WIA 1991.

As statutory water undertakings, all water companies have prepared and developed Water Resources Management Plans (WRMP), setting out their proposed strategy and assessment of the options available to balance supply and demand for water resources over a period of 25 years. They reflect the changing nature of obligations on companies to meet customers' needs whilst also protecting the environment. A key element of the planning process is the assessment of options to maintain the supply demand balance available to individual companies, which includes assessment and appraisal of inter-company and intra-company transfers of water.

Prior to the Water Act 2003, these plans were submitted to the Environment Agency on a voluntary basis and to Ofwat (The Water Services Regulatory Authority) in support of companies' strategic business plans. The 2003 Act (Section 62), inserted section 37 A-D into the Water Industry Act (WIA) imposing a statutory obligation on all statutory water undertakers to prepare and submit a WRMP every five years. Section 37 A-D specifically refers to *"...measures which the water undertaker intends to take…"* and *"…the likely sequence and timing for implementing those measures…".*

Section 37C of the WIA imposes a duty on water suppliers to share information with water undertakers in support of the development of WRMPs. This may relate to any information reasonably requested for the purposes of preparing the WRMP and could, therefore, be taken to include information in support of, or related to, current or potential resource surplus / deficit, potential schemes to share available resources and their costs.

Section 37 sets out the framework for delivery of the WRMP and the provision of Directions by the Secretary of State which undertakers are required to comply with in preparing their plans. The Water Resources Management Plan Direction 2007 identifies matters for consideration in developing a WRMP, including *"…appraisal methodologies….in choosing the measures it intends to take or continue…, and its reasons for choosing those measures."* In this context, the appraisal of measures will include assessment of potential resource transfers, whether between resource zones within a company or between different companies.

In addition to the above, the Environment Agency published its Water Resource Planning Guideline in April 2007 (revised in November 2008), pursuant of its duties to secure the proper use of water resources (Water Resources Act 1991). Although non-statutory, the Guideline sets out the framework companies should follow in the development and reporting of their WRMP. One of the key elements of that framework is the selection and appraisal of options to balance supply and demand that will underpin companies' water resources investment strategies. The appraisal process is based on a screening of environmental, sustainability, economic and engineering feasibility. The preferred strategy is then optimised on a least cost basis, using the average incremental social cost (AISC), which monetises economic, engineering, environmental and social costs of capital and operating costs per Ml developed on a whole life basis.

The overriding objective of the regulatory framework set out above is the planning and delivery of security of water supplies in England and Wales. The funding of schemes to deliver security of supply is delivered through the periodic review process in which companies' business plans, including detailed investment and operational plans, are scrutinised by Ofwat and approved on a rolling 5 yearly basis (Section 2.5).

Transfers of water

Bulk transfer of water, or bulk supplies, are treated separately in the WIA. We presume this has come about, at least in part, through recognition of the existing and potential strategic scale of supply links between water undertakers (rather than within) at privatisation. The legislation differentiates between bulk supplies between water undertakers and supplies made by competitive entrants, or licensees. Section 40 of the WIA specifically refers to agreements to supplies between water undertakers and provides the basis for Ofwat, on application by a water undertaker, to require undertakers to give or take a supply, or to determine terms (including costs) and conditions where it is necessary or expedient. In determining terms, Ofwat will have regard to:

- Securing the efficient use of water resources or the efficient supply of water.
- The availability of resources and potential for risk to security of supply in making a bulk supply available.
- The long run marginal costs (which are provided for the Periodic Review) and large user tariffs offered by the supplier, to assess the cost basis for a bulk supply.
- The need for intervention where agreement cannot be reached between the parties themselves.

The Water Act 2003 amends Section 20B of the Water Resources Act 1991 (WRA) to allow the Environment Agency, in consultation with Ofwat, to propose

that a water undertaker should seek a bulk supply of water from another water undertaker where it appears to the Agency that it would be a necessary measure to secure the proper use of water resources. In so doing, the Agency may include in its proposal details of the period over which the supply could be made and any terms and conditions it considers appropriate. The Act also inserts a new clause in the WRA allowing the Agency, in the carrying out of its duties in dealing with any abstraction licence application, to have "…*regard to any failure on the part of the applicant to make an application under section 40…pursuant to a proposal made by the Agency…*" under section 20 of the WRA.

Competition and Security of Supplies: Supplier of last resort

Competition to provide water supplies has been promoted largely through two main routes to date: through common carriage access (between water undertakers) and through licensed water suppliers.

Common carriage arrangements allow water undertakers to access one another's networks for the purposes of providing water or sewerage services. The entrant is responsible for ensuring that it is able to provide security of supply for its customers. However, the incumbent water undertaker remains responsible for any failure in supply as a result of its obligations under the WIA to provide supplies to all customers in its Area of Appointment (as defined by its licence). Therefore, if the entrant fails to make enough water available to supply its customers, then the incumbent is obliged to provide a supply if requested (Ofwat MD154). This is typically referred to as "the supplier of last resort", although there is no statutory duty defined as supplier of last resort on the water undertaker; the statutory duty is limited to domestic purposes and supplies can be limited in time to 3 months (under the interim supply duty, discussed below). Common carriage agreements may typically refer to a non-statutory 'stand-by' service which may be made at an agreed charge.

Arrangements for licensed water suppliers came about following amendments by the Water Act 2003 to Section 63AC of the WIA, permitting a company that is the holder of a Water Supply Licence to have access to a water undertaker's supply system to supply water to eligible premises. In this context, licences are currently restricted to supplies in excess of 50Ml per annum and cannot be for domestic purposes. Ofwat is currently consulting on proposals to reduce that threshold to 5Ml/a following recommendations in the Cave Review (Ofwat 2010c). Whilst the current implications for this study are limited (to date, only one customer has switched supplies to a licensee), the principles concerned could have implications if and when competition within the water industry is extended.

Under current arrangements, if a customer takes a supply of water from a licensee and either the licensee or the supply subsequently fails, then an 'interim supply duty' falls to the incumbent water undertaker, in accordance with Section

63AC of the WIA. The incumbent water undertaker will supply water to the licensee under certain conditions and is entitled to charge the customer for the water provided under its interim supply duty in accordance with Section 143 of the WIA.

The interim supply duty is not absolute; it may be confined to domestic supplies only and does not apply where the provision of the supply would put at risk the water undertaker's ability to meet its own supply obligations and / or require unreasonable expenditure to do so.

The interim supply duty, where it does apply, ensures that customers continue to receive water for up to three months after which the water undertaker can serve notice of disconnection.

Under Sections 66G and 66H of the WIA91, Ofwat may designate a licensed supply as a strategic supply (or collective strategic supply when more than one supply is made) where if, without the introduction of water being made, there is a substantial risk that the incumbent water company would be unable to maintain supplies to its own customers, as well as supplying the licensee's customers with water for domestic purposes. To date, no such designations have been necessary.

Water Resource Planning

The regulatory approach to water supply planning in England has evolved since privatisation and is now enshrined in the EA Water Resource Planning Guideline and to a lesser extent Ofwat's reporting requirements for the Business Plan and June Returns. The guiding principle is that under specific design conditions the available supplies in a given WRZ should be sufficient to meet forecast demands plus a headroom allowance to take account of uncertainty and risk. The design condition comprises higher than normal demands, as a result of prolonged spells of hot dry weather, combined with periods of low rainfall leading to low river-flows and depressed groundwater levels.

The precise characteristics of the design conditions may be different for each WRZ depending on factors such as the mix of water resources, the demographic structure of the customer base, and the types of non-household demands. Different types of water source, for example upland storage reservoirs, pumped storage reservoirs, run-of-river abstractions and the range of groundwater sources, respond to periods of low rainfall and droughts in different ways.

The water resource planning process requires the supply demand balance to be assessed under the specified design conditions in each of the 25 years of the planning period. In years of more normal hydrological conditions when demands are lower, river flows more plentiful and groundwater levels higher, there will be greater margins between available supplies and demands. This means that the water undertaker has more flexibility in the operational management of its

sources, water treatment works and distribution network. Water could also be made available to neighbouring WRZs, but under favourable demand and hydrological conditions, additional supplies may not actually be required.

Options to increase available supplies, and demand management measures to reduce demands are identified in order to maintain the supply demand balance under design conditions.

In general the supply demand balance evolves with small incremental changes year on year. However step-changes in the supply demand balance can arise for a number of reasons (with different levels of risk) including:

- Change in deployable output as a result of a sustainability reduction to an existing abstraction licence.
- Expiry of a time-limited licence.
- Expiry of a bulk supply agreement.
- Loss or addition of a major new customer.
- Commissioning of a major new resource.

Step-changes in the supply demand balance such as these are seen by some water undertakers as major uncertainties and risks to maintaining security of supplies to their own customers, let alone to honouring the provision of supplies to a neighbouring water undertaker under a bulk supply agreement.

Regulatory Framework and Incentives for Interconnectivity

Economic Regulation

Price regulation of the water industry by Ofwat has followed an RPI+K approach since privatisation, incentivising companies to deliver efficiencies and outperform on operating and capital programmes for the 5 year review period. There are two key 'building blocks' in this process of relevance here: the return on capital, and, operating costs (Opex). Companies' investment in new assets (e.g. water resources, treatment, distribution and network infrastructure, etc) is reflected in their Regulatory Capital Value (RCV), on which they can earn a return. As a result, the regulatory framework provides a direct incentive for companies to develop their own resources which will have a capital value on which they can earn a return. Companies that develop and provide a bulk supply, therefore, will be able to earn a return on capital for that scheme.

The approach to Opex (which includes treatment, pumping, staff costs etc) is focussed on efficiency and outperformance. Where a company is entirely responsible for the delivery of its services, efficiency and outperformance can be delivered. However, Opex also includes the import of water as a bulk supply from another company. Where a bulk supply is concerned, there is no scope for

efficiencies or outperformance because the costs are outside of the control of the receiving water company.

Acknowledging the need to improve incentives for companies to make better use of their assets and making bulk supplies available to others, Ofwat has since the 2004 Periodic Review allowed exporting companies to retain profits on bulk supplies for a period of five years before giving the benefit to customers.

Companies receiving a bulk supply may earn some return on capital where they have invested in and developed associated infrastructure, such as networks and / or additional treatment (e.g. softening).

Security of Supply Obligations

Stakeholders emphasised that the security of supply obligations on companies tends to incentivise a "predict and provide" culture within the industry. This is compounded by the economic regulatory framework, which effectively incentivises a company to develop its own capital solutions, as described above. Whilst the legislation clearly requires companies to plan to meet all their obligations, the 2003 Act and the associated guidance (summarised in Section 2.1) has been developed to provide a framework for delivering a sustainable approach to security of supply. Companies are directed to give appropriate consideration to a twin-track approach, providing a balanced assessment of all supply and demand management options that may contribute to providing security of supply in the development of their plans. Companies will take a view on the risk and benefits that each option may impose on their obligations and their business. However, because the WRMPs have until 2007 been essentially voluntary submissions (they have been a requirement to support Business Plans since PR04), regulatory influence over the selection of schemes has been limited mainly in relation to the economic impact (cost to customers) and/or potential challenge on the subsequent application for abstraction licence.

In the course of developing their WRMPs, companies are required to consult with the neighbouring companies with whom they have bulk supply arrangements to confirm their future requirements. Companies' options assessments have to date also included appraisal of a broad range of additional interconnectivity options (e.g. various Severn to Thames transfer options, transfers via the British Waterways (BW) canal network, use of third party dewatering volumes, transfers from regional storage schemes etc). Companies are not, however, explicitly required to consult each other on the nature of their supply surplus / deficit and, therefore, the opportunities for interconnectivity through new or enhanced bulk supply arrangements where supplies may be managed more effectively.

A critical consideration for companies in assessing risks to their security of supply is the potential impact of new environmental obligations on them. These are discussed further in Section 2.6.2.

Water Resources in the South East (WRSE)

The WRSE Group has brought together the Agency, Ofwat and water companies in the South East to look at regional water resources options and in particular the scope for greater interconnectivity within and between those companies. The WRSE was formed in the aftermath of the Monopolies and Mergers Commission report on the proposed merger of Mid Kent Water Holdings plc with General Utilities PLC and SAUR Water Services plc (January 1997). It is worth noting that the report states:

> *"If all the water undertakers in the region were prepared to co-operate one with another and with the two regulators we have no doubt that satisfactory long-term solutions could be found which would benefit the consumer. The DGWS and Environment Agency have between them the necessary powers and influence to help develop such solutions."*

The outputs from WRSE have developed over time and have had increasingly influenced companies WRMPs, particularly the current plans. However, despite the combined efforts of the group, there is still a significant divergence of opinion between the regulators and the companies in terms of the viability of interconnectivity options and on agreement of the overall water resources strategy. The issues behind this will be explored in Section 3.

Risks and uncertainties

The regulatory framework itself can present a number of risks and uncertainties which can be perceived as barriers and constraints to interconnectivity. The main risks and uncertainties can be considered under the following headings:

- Environmental Regulation.
- Environmental Sustainability Obligations.
- Carbon and Climate Change.
- Levels of Service.
- Quality and Customer Impacts.

The risks and uncertainties for each of these are discussed below.

Environmental Regulation

From the foregoing it is apparent that the regulatory framework can impose a number of constraints on the potential for greater interconnectivity and sharing of supplies.

A significant risk and uncertainty to companies approach to interconnectivity lies in the potential introduction of time limiting all abstraction licences[1]. Abstraction licences have historically been granted without a time limit and currently some 80% of those licences in force are granted in perpetuity. Moreover, the current licensing regime does not allow the Agency to readily vary (or reallocate) licences where it may be necessary to secure the proper use of water resources and to ensure that the environment objectives for a water body continue to be met in future given pressures such as climate change. Time limiting of licences, whether targeted or universal, is likely to significantly increase the uncertainty over water availability water companies have to take into account within their planning. This in turn will impact on the viability of interconnectivity schemes without investment in new schemes (new sources, demand management measures etc) to replace any lost capacity as a result of licence changes.

Time limiting licences may encourage new approaches to trading as well as allocation of licences. However, for trading to be effective, costs will need to take into account the relative cost of water scarcity – a term more commonly associated with the challenges of Africa; there is currently no formally agreed definition of water scarcity applied to England and Wales, although areas of water stress have been identified to progress compulsory domestic metering. However, such a concept could significantly influence the economic and environmental rationale for interconnectivity, provided that the overall costs (to customers, tax payers and the environment from potentially increased carbon costs) and benefits were acceptable. A clear price signal - water being cheaper in water abundant areas and more expensive in water scarce areas – could provide a significant driver for interconnectivity and sharing of resources.

Environmental Sustainability Obligations

A critical consideration for companies in assessing risks to their security of supply is the potential impact of new environmental obligations on them. The National Environment Programme (NEP) sets out the obligations companies are expected to address through their investment programmes, in this context, in relation to water resources schemes identified within the Agency's Restoring Sustainable Abstraction (RSA) Programme. This will typically involve a range of schemes from investigations to implementation to address drivers such as the Habitats Directive and Water Framework Directive. These schemes will often lead to some form of variation or revocation of companies' abstraction licences and, as a result, can create a significant degree of uncertainty for companies when assessing the deployable output of their sources which underpins their supply-demand balance and assessment of security of supply. The resulting lack of confidence in longer term resource availability means that any potential for

[1] "Taking Water Responsibly - Government decisions following consultation on changes to the water abstraction licensing system in England and Wales", DETR and Welsh Office, March 1999 and more recently "Consultation on Proposals for Time Limiting of Water Abstraction Licences", Defra 2009.

interconnectivity and resource sharing will be limited. The Agency issues guidance to companies in support of their development of WRMPs identifying those Environmental Sustainability schemes that should be included within their assessment of supply-demand balance. Only those schemes where a resolution has been identified and funding agreed with Ofwat should be included by companies in their plans; any scheme that is subject to new or ongoing investigation is excluded.

The Agency's CAMS publications and Water Framework Directive (WFD) River Basin Management Plans identify those catchments which are assessed as over-licensed or over-abstracted and where abstraction is considered to be impacting on ecological status of water bodies. These identify the potential risks to companies' licensed resources and the implications for their supply-demand balance and are key drivers for schemes to be included within the National Environment Programme.

However, where the need for schemes have not been agreed by the Agency, the disparity between the assessments published through CAMS and WFD compared to those of the WRMPs under direction of the Agency provides an often clear and contradictory message about resources available both to meet existing supply-demand requirements and for potential interconnectivity options. The uncertainties created mean that any potential opportunities for resource sharing will be limited because companies' first priority will be maintaining their own security of supply. Further discussion of perceived barriers created by uncertainty in the timing and magnitude of changes to abstraction licences to meet environmental sustainability obligations are discussed in Section 3.6.1.

The WFD imposes challenging new obligations on the industry in order to deliver good ecological status which in themselves will impose risks and uncertainties to interconnectivity schemes that are reliant on rivers to transfer water. The potential modifications to flow regimes, water quality and ecology and, therefore, potential designation of the water body concerned as "heavily modified", will mean that schemes may be subject to much greater scrutiny and challenge, making the promotion of any potential scheme complex, high risk and costly.

Carbon and Climate Change

The need to plan for climate change both through mitigation and adaptation measures is now broadly accepted; however, planning for a changing climate imposes a number of risks and uncertainties. All companies have identified targets to reduce their carbon footprint in response to the governments' target of cutting greenhouse gases emissions by 80% CO_2 equivalent (measured against 1990 levels) within the next 40 years. This is driving companies to look very closely at carbon critical design and the provision of lower cost, lower energy and carbon footprint solutions for their businesses. This underlines a significant uncertainty with respect to potential interconnectivity and sharing of resources in

relation to the energy and carbon costs associated with both the infrastructure (embedded carbon) and pumping costs (operational carbon) in making a bulk supply available.

The current regulatory framework already provides an incentive to companies to consider carbon reduction through operating efficiencies in reducing energy use. From April 2010, water companies will be required to participate in the Carbon Reduction Commitment (CRC), a "cap and trade" system that permits companies to emit a limited volume of CO_2. Participation in the CRC raises a fundamental question over how carbon should be allocated and reported in the case of interconnectivity schemes. Whilst financial costs would normally be passed through to the customer (in this case, receiving company), the current regulatory guidance is that the CRC costs cannot be passed through. Companies have suggested that this is counter to the normal regulatory approach of cost pass through and is counter to that put in place for regulation of the electricity industry. The implications for supplier and receiving companies are discussed in Section 3.5. At the present time, whilst the financial costs of carbon are low, this is unlikely to influence companies significantly. However, as the shadow price of carbon rises significantly in order to provide an incentive for carbon trading, the impact on supplier companies could be significant.

Climate change uncertainties around variation to the seasonal distribution of rainfall and temperature and its impacts on both resource availability and demand for water will influence companies' views of risk to their security of supply and, therefore, the viability of interconnectivity schemes.

Levels of Service

A major consideration to companies in assessing options for interconnectivity is the potential impact on their ability to maintain security of supply and, therefore, the impact on levels of service to customers. As described above, companies' first priority will be maintaining their supply obligations – their security of supply and the levels of service provided to their customers. Risks may arise in two key areas:

- Continuity of supplies during drought; and,
- Expectations where levels of service may be different between donor and receiving companies.

A number of existing bulk supply arrangements include conditions relating to proportionality of pain / gain (or "shared misery") which allow the transfer quantities to be reduced during times of drought and / or for restrictions to be imposed in the receiving company consistent with any imposed by the donor company on its customers. The principle of proportionality has worked well in the past, particularly where a drought has impacted regionally. However, this relies on acceptance of the fact that no supplying company can guarantee to supply at

all times and similarly, the receiving company cannot expect to rely on that supply at all times during drought; to do so would require significant overinvestment in capacity in the donor's infrastructure.

However, where companies have different levels of service, the expectations of donor and receiving companies regarding the guarantees of supply can lead to interconnectivity options being discounted or to customer complaints as a result of their perception that their water use is being restricted whilst supplies are still being made to the neighbouring company whose customers remain unaffected by restrictions.

These issues can be compounded where companies have revised their assessment of source deployable output following their operational experience during a more recent and exceptional drought period.

Quality and Customer Impacts

In addition to customer impacts arising in relation to supply restrictions and bulk transfers (Section 2.6.4), potential implications for drinking water quality and customers in receiving supplies from another company's source should not be underestimated. Typically, this may include changes to taste and odour as a result of introducing supplies from a different source. Whilst the water supplied will be wholesome and meet all drinking water standards, a change in taste or odour can lead to customer perception of poor water quality and, therefore, complaints.

Some companies are required to provide additional treatment under local statute; for example, softening (e.g. Sutton and East Surrey) or fluoridation. The additional costs imposed may make interconnectivity options less economic and attractive compared to companies own solutions.

Unforeseen quality impacts may also influence companies' views of interconnectivity, particularly in areas where there are increasing incidents of pesticide or other failures of quality standards. The risk of water quality failure becomes more important where the receiving company may already have a high, but acceptable level of one pesticide and the donor company becomes exposed to, or has a high level of another pesticide. In combination, this could result in total water quality failure.

Barriers identified

Introduction

From the foregoing, it is apparent that there are a number of aspects of the current regulatory and planning regime that impose unintentional constraints on the potential for interconnectivity and more effective sharing of resources between companies. Table 3.1 provides a summary of the range of potential barriers and constraints assuming, all other factors being equal, that there is spare resource capacity to be exploited or that capacity could be made available through more selective and conjunctive planning. The issues have been drawn together following a review of publicly available information together with a workshop with expertise from within Atkins drawn from water resources, regulatory auditing and business analysis.

Table 0.1– Potential regulatory barriers and constraints to interconnectivity

Regulatory instrument / aspect	Issue
Regulation & Finance	
Economic Regulation	
Return on RCV	Incentivises investment in own capital solutions. There may be some benefit to receiving companies from investment on associated infrastructure. Regulatory accounting rules restrict investment on assets not belonging to the Company
Opex Efficiency	Discourages investment in bulk supplies from other companies because receiving companies have no control over price and achievement of operating efficiency.
Funding for intra-company transfers	Available to companies where need and benefit can be demonstrated e.g. resilience, SEMD and Security of Supply between Water Resource Zones.
Determining bulk supplies (BS)	Ofwat's powers are subject to being requested by companies to determine terms. There are few cases where this has actually happened (e.g. Albion, Folkestone, etc.).
Finance	
Cost of bulk supplies	Commercial rates for BS may be higher than equivalent new resource development and operating costs so little incentive to purchase.
Commercial viability	Whether there is sufficient benefit to justify management effort? Will be influenced by scale and costs and limitations on revenue benefit.
Revenue benefits	Limited to 5 years after which revenue is included within the price review mechanism, limiting incentive to donor companies.
Transparency	Lack of consistent and transparent information upon which to base decisions; current reliance on AISC data from WRMP or average costs of production and distribution.

Environmental Regulation	
'Need' for abstractions	Perceived EA preference for companies to apply for licences within their direct area of undertaking. Companies reluctant to develop resources outside their statutory supply area. Does demand remote from the point of supply justify 'Need'?
Planning and consents	Concerns regarding resources being transferred out of catchment, to (or by) a supply company whose customers are outside the area affected.
WFD implications	Implications for ecological status and Artificial and Heavily Modified Water Body (AW/HMWB) designation in the case of river to river transfers could make the 'environmental burden' too onerous.
Planning consents for pipelines	Planning challenges, both urban and high value rural environments
Planning Framework	
Carbon & Energy	
Significant pumping costs	A critical consideration in terms of financial and sustainability criteria. Impacts on both carbon and energy costs. Implications of CRC; disincentive of constraint on passing on carbon to receiving companies.
Security of Supply	
Security of Supply (SoS)	Disincentives due to risks to SoS in making a BS (e.g. resource availability, drought deployable output, levels of service, PR consequences, Ofwat Overall Performance Assessments (OPA), etc).
Supplier of last resort	Reliance on bulk supplier; risks to SoS during drought and impacts on levels of service through restrictions.
Levels of service (LoS)	Risk of restrictions on bulk supplies as a result of differences in LoS between donor / receiver
Deployable output (DO)	Risks where agreed value for DO and DO split on shared resources is re-evaluated following drought operational experience. Particular issue where companies have different LoS.
Water Resource Zones	Implications of the introduction of BS for re-evaluation of WRZ boundaries and reporting.
Abstraction Licence uncertainty	Uncertainties of National Environment Programme / WFD and risks to Security of Supply, undermines commercial confidence in any basis for sharing / trading. Risk of "stranded assets" where licences are varied.
WRMP Framework	Insular, within company, potentially missing Conjunctive resource management opportunities between companies.
Extreme events	Benefits of interconnectivity to extreme events such as 2007 flooding (e.g. Mythe water treatment works) are not assessed within current framework.
Risk Aversion	Need to 'unpack' the risks perceived by companies, where different from above.
Planning new schemes / Inquiries	Legal opinion re: single company promotion versus JV and greater likelihood of success of former. Undermines commercial trust on any subsequent opportunity for interconnectivity.
Ownership / risk	Preference toward ownership rather than shared reliance to ensure, and manage risk exposure to, security of supply. Issue of agreement over size of DO and 'real' allocation where scheme and original design are not owned and agreed between donor & recipient.

Legal agreements	The view that 'Bulk supply is only as good as your lawyer' reflects lack of confidence in reliability during drought; conditions allowing donor company to limit (or cease) supplies during drought or to require recipient company to impose restrictions, matching those in place in the donor supply area and conflict with own LoS.
Risk to quality	Potential risks to supply and quality failure where donor source quality deteriorates (e.g. pesticide contamination).
Competition	Exposure where companies invest in infrastructure improvements to make bulk supplies; neighbouring companies may see a competitive entry advantage.
Customer	
Taste and odour, Softening requirements etc	Can be practical (and therefore cost) issues and implications to customers (and therefore DWI) when waters are mixed.
Perception of Levels of Service	Customer perception of transfers when own supplies are affected by drought…."*Styx Water imposes hosepipe ban but continues to profit from providing water to neighbouring company …"*

These issues have been used as the basis for consultation to explore specific issues and concerns in detail with stakeholders. The stakeholder responses to our consultation are summarised in Table 3.2; those aspects considered by stakeholders to be more important or potentially critical to the effective development and implementation of interconnectivity of supplies are discussed further below.

Figure 0.1 – Key barriers and constraints identified in consultation

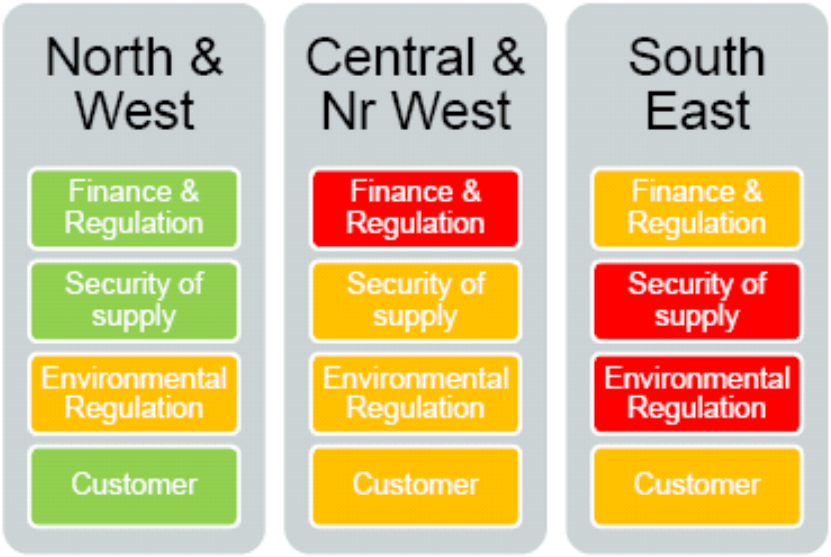


Figure 3.1 summarises the key barriers and constraints identified by stakeholders during consultation, emphasising the degree to which particular issues have greater geographic significance to the industry. This is not intended to reflect the

relative importance of any one aspect over another to a water company, rather our interpretation of companies' views expressed through consultation of the extent to which these issues impose greater (red) or lesser (green) barriers and constraints to interconnectivity and resource sharing. Stakeholders' views on these issues are explored below.

Economic Regulation and Finance

Return on investment

The limited return on investment in bulk supply assets is a critical issue for many companies. Under the current regulatory framework, donor companies are able to retain the revenue benefits from new bulk supplies for the first 5 years of operation, after which the benefit is passed on to customers. Bulk supply companies are also subject to Opex efficiencies, imposing a further disincentive to interconnectivity.

Companies have indicated that they would be more likely to evaluate opportunities for interconnectivity if the arrangements for return on investment were more favourable. Those companies also readily acknowledge that the current regulatory regime incentivises investment in Capex solutions over Opex; the benefits to companies are currently largely in favour of the supplier company whilst Opex efficiencies can effectively penalise the receiving company, creating a barrier for development of new schemes.

The significance of restricting the benefit period to companies to 5 years will vary depending on the nature of agreement negotiated between the donor and the recipient. Where short term contracts are appropriate, there may be benefits to donor companies. However, where longer term contracts may be necessary to justify involvement, revenues will be included within the normal periodic review process. In this case, where a profitable bulk supply provides an increase in revenue, the effect of higher base revenues and a lower k factor at the subsequent price review would curtail the potential benefit to the donor company.

In discussion, Ofwat acknowledged that the arrangements put in place in 2004 provide only a limited incentive to companies to enter into interconnectivity arrangements. As a consequence, Ofwat is currently considering alternative approaches which will allow companies to retain the benefits of investment in interconnectivity schemes, potentially through a price cap mechanism. We have assumed on this basis that the Revenue Correction Mechanism, which claws back in-period revenue out performance for customers benefit, will not be applied in respect of bulk supplies.

Opex efficiencies

A number of companies pointed to the unacceptable risks arising as a result of lack of control over Opex through bulk supply costs and that if bulk supply costs

were removed from the efficiency assessment the opportunities for sharing water resources are more likely to be evaluated by companies.

Companies' concerns relate to how the costs of bulk supply imports and exports are taken from their June Return submissions (Table 21 'Current Cost accounting – Water Service') and applied within Ofwat's relative efficiency assessment.

The costs of imported bulk supplies that are directly attributable to identified service activities (Water resources and treatment, Water distribution and Water service) are included within Ofwat's efficiency assessment. By contrast, the operating costs of providing bulk supplies to third parties are not. For companies receiving a bulk supply import, increased spending on bulk supplies will impact on Ofwat's assessment of relative efficiency which could, as a result, impact on price limits.

Companies' view of risks is influenced by a number of factors but in particular:

- Visibility of expenditure and justification of the costs passed through to the receiving company.
- Accountability and control of expenditure (Capex and Opex). Companies could insist on reviewing or auditing the costs associated with a shared resource, some don't because the additional costs are unlikely to outweigh any savings.

Ofwat may grant companies a 'special factor' allowance but only when the costs of the bulk supply imports are in excess of 1% of total Opex. Details of special factor allowances granted by Ofwat for PR09 are not currently publicly available, so the number of companies benefitting from this arrangement is not clear. The allowance can provide an incentive to companies. South East Water (SEW) is one of a number of companies that benefit from this arrangement; the special factor allowance effectively moves SEW from 9th to 2nd place ranking in Ofwat's efficiency assessment. Ofwat has accepted their argument that the operating costs of SEWs shared resources are not as efficient as the company's own sources. However, the company has noted that the special factor only accounts for part of the increase in costs and so does not, in the company's view, fully address the impact of their bulk supply schemes on the Opex efficiency assessment.

Competition and Trading

The promotion of competition and trading between companies provide both incentives and disincentives to companies. Ofwat (2010b) suggests that suitable market arrangements would encourage interconnection and trading – where it benefits companies, consumers and the environment – and could generate significant savings to companies. A number of companies support the concept of trading, particularly the opportunity for upstream trading of abstraction licences

along with the development of water scarcity pricing which could provide much greater incentives for interconnectivity (see Section 3.4).

However, from discussion with stakeholders, commercial competition between companies has also created some barriers to interconnectivity; commercial imperatives around companies' security of supply obligations to one side (they are discussed in Section in 3.3), these include:

- Visibility: of likely costs and quantities available. A number of stakeholders referred to discussion of opportunities for supplies and of the potential commercial terms of the supply and quantities that may be available as being protracted exchanges around How much can you supply? How much do you need? How much will it cost? Depends on how much you need! This is due in large part to the lack of, and transparency of, quantities and costs of supplies. Although companies are now required to publish their WRMPs, approaches to the assessment, and detailed costs, of scheme AISCs can vary significantly between companies. This has been an ongoing issue with WRSE.
- Exposure to competitive entry: some companies have expressed concerns that where they have invested in infrastructure improvements to make or receive bulk supplies, this effectively opens up their system to competitive entry advantage by neighbouring companies.
- Mergers: whilst merger opportunities, particularly in the South East, have been identified by companies that would provide interconnectivity benefits, Ofwat has objected on the grounds of loss of comparators and has argued in response that competition itself would provide the incentive for companies to share supplies.

A number of stakeholders expressed the view that in order to incentivise interconnectivity and to facilitate a market for trading, the Agency and Ofwat need to work more closely to ensure more robust information is available at the resource zone level. Differences in approach by companies in estimating scheme AISCs have been highlighted and a view expressed that the AISC should more closely reflect the true marginal cost of supply.

Security of Supply

Meeting security of supply obligations is a critical issue for companies' decision making processes and customer expectation of companies to maintain supplies is a key driver for investment in schemes that will provide guaranteed supplies. Companies' focus on their security of supply obligations is particularly acute in the South East where pressures on water resources are such that the security of supply obligations acts as a constraint on companies sharing resources; their priority is planning to meet their own customers' requirements first. Ofwat's

assessment of companies' Security of Supply Index (SOSI) incentivises companies' focus; where a company fails to achieve its target and funded SOSI level, Ofwat would treat this as a shortfall in the delivery of service and penalise the company by not including the associated expenditure in price limits.

Some stakeholders feel that interconnectivity schemes provide companies with a more flexible response to uncertainties identified within their WRMPs, such as climate change, supporting an incremental response to meeting supply-demand risks. However, where companies may need to rely on a bulk supply, they would need to be satisfied that a supplier could match their expectations and guarantee to supply. Where the company level of service is high, that company would need to manage the operational and supply-demand risks in its system to very low levels and the supplier would be required to ensure its resources remained unrestricted. Companies demanding guaranteed supplies would need to consider the likely impact on costs, the requirement for a very challenging due diligence assessment of the supplier and the supply scheme and associated infrastructure, and the management implications of operating and maintaining such a scheme. Where the levels of service offered by the companies concerned differs, this can result in opportunities for interconnectivity being declined (this was a critical contributory factor in bulk supply opportunities between Wessex and Bristol being declined, [referred to in consultation with stakeholders]) and for other companies to exclude such options from their preferred strategy.

Many existing schemes acknowledge the impracticality of a guaranteed level of security because resources and supplies cannot be guaranteed during drought (e.g. bulk supplies made by Thames Water). These schemes typically include clauses for reducing supplies and / or requiring the imposition of restrictions commensurate with those imposed on the supplying company's own customers. As a result, they do not provide a secure supply.

This issue is emphasised by particular circumstances affecting South East Water (SEW) where the volume of bulk supplies available to it from the River Medway Scheme under agreement was reduced following a review of the source deployable output by the supplier company in the light of recent drought operational experience and more rigorous best practice analysis when the yield of the scheme fell considerably. The impacts of a change in the deployable output of a scheme can be significant:

- On the receiving company's ability to maintain security of supply, particularly during drought.
- Requiring investment in the development of additional resources and infrastructure to maintain the scheme output to meet the supply-demand requirements of all companies concerned. This may also increase operating costs and, therefore, risks to the receiving company for Opex efficiency penalties.

- Had the scheme been originally specified at a lower output it may not have been the least cost option, although this would have been difficult to anticipate.
- Leaving stranded assets where the scheme is considered no longer viable (because of financial, environmental or sustainability constraints).
- Impacts on the supply-demand strategy where the lead time does not allow the development of alternative economic solutions.

Experience through periods of drought since the 1990s has left many stakeholders with the overriding view that the bulk supply arrangement is only ever as good as the agreement – or the lawyer who drafted the agreement. It is not an issue that would be easily resolvable by intervention using the legislative powers of either Ofwat or the Agency, although there would be some potential benefit from development of a model bulk supply agreement that recognises companies' security of supply obligations and the practical issues of managing supplies during times of drought, and a consistent approach to the implementation of demand restrictions to customers in both the donor and receiving company. It does emphasise the need for a collaborative approach to the planning and management of interconnectivity schemes, which in itself will drive a requirement for greater transparency between stakeholders.

Acknowledging these issues, a number of stakeholders have expressed the view that interconnectivity schemes would be better managed through a joint ownership arrangement. There are a number of examples where such arrangements appear to have worked well over recent years: Veolia South (formerly Folkestone & Dover)/ Southern Water, Wessex / South West and Anglian / Veolia East (formerly Tendring Hundred Water). However, this is not without its own challenges. Generally, the company with the greatest interest / share in the scheme will take on the management of the scheme and pass on costs to the other companies involved. In cases where there has been an apparent low level of engagement between the joint interests, this has resulted in a number of issues around the transparency of Capex and Opex costs, the justification and accountability for expenditure to ensure schemes are being managed and operated efficiently and effectively.

Developing interconnectivity schemes solely to meet needs during drought will be expensive; because droughts are relatively rare in UK, the Capex costs are high relative to the benefit of the volume of water actually used. The lack of a drought and / or water scarcity tariff will make drought only schemes much less financially attractive for companies.

The risks to companies from reduced yields of schemes due to deployable output changes increase as a result of abstraction licence uncertainties. This arises from two drivers:

- The impact of sustainability reductions on abstraction through the National Environment Programme.
- The potential impact of proposals to introduce time limited licensing.

These are considered further in Section 3.4.

Environmental Regulation and Water Scarcity

Abstraction licence uncertainty has been identified as a critical risk to companies. The apparent lack of consistency between the Agency's published resource assessments that underpin the WFD River Basin Management Plans and CAMS licensing strategies compared with Agency guidance to companies on schemes which should be included in the WRMP process to address sustainability reductions in abstraction leaves companies with significant uncertainties about their resource base, the potential impacts on their supply-demand balance and, therefore, the nature (and timing) of investment in future resource requirements. This has a direct effect on companies' appetite to consider opportunities for interconnectivity and resource sharing.

Guidance issued by the Agency to support the development of companies' WRMPs specifically directs companies to include only those schemes for addressing Sustainability Reductions where a resolution has been identified and funded; any scheme that is subject to new or ongoing investigation should be excluded from companies' assessments of the supply-demand balance. Companies argue that this fundamentally undermines the value of their plans which are intended to provide a strategy spanning 25 years; their plans may show a surplus of water available for use when in fact there is a significant risk to that quantity being available throughout the planning period. That risk is confirmed by the Agency's CAMS process, where catchments may well be shown to be over-licensed or over-abstracted presenting a clear contradiction between guidance to companies and the assessments at catchment and company levels. There are good examples of this across the South East; for example, Veolia South East and Southern Water.

This arises because of the uncertainties in the current assessments and the need for further investigations in relation to the potential for, and scale of, impact by those abstractions identified. Such uncertainties will be compounded by the potential impacts of climate change. The Agency has argued that schemes still subject to investigation and options appraisal should not be included within companies' plans and that they will use the regulatory process to allow sufficient time for companies to put in place an appropriate strategic response as and when an impact is proven.

The uncertainties created mean that any potential opportunities for resource sharing will be limited because companies' first priority will be maintaining their own security of supply. As a result, potential options are likely to be limited to

shorter term (c.5 years) arrangements. However, that timescale limitation will also impact on the financial viability of schemes – whether companies can recoup their investment in infrastructure etc. in making supplies available and / or whether there is a significant risk of stranded assets as a result of any subsequent licence variations.

Proposals to time limit abstraction licences will increase uncertainty over water availability particularly in the South East, creating further doubt over the feasibility and reliability of interconnectivity schemes. By contrast, reflecting the additional uncertainty within companies' assessment of headroom within their WRMPs may also drive earlier investment in schemes - which may include options for greater interconnectivity and sharing of water resources. Providing a robust strategy to respond to these uncertainties is a major challenge to companies, particularly ensuring that they invest in the most cost-effective solutions and that their investment plan is not subsequently undermined as a result of unplanned changes to their available resources.

A number of stakeholders (e.g. Ofwat, Environment Agency, Thames Water, Severn Trent Water) have promoted the concept of water scarcity as a way of incorporating the "true cost" of the environment when assessing water resources and supply management options. Currently the costs of schemes take little account of the actual or potential for impact on the environment; whilst charges for licensed abstraction include an element of regional environment improvement charge, there is no significant differentiation in charges based on scarcity, environmental sensitivity or social value because the legislation only allows charges to be based on cost recovery. Under the current regime, that excludes any costs for environmental improvement such as sustainability reductions in abstraction. The appraisal of schemes within the WRMP process includes assessment of AISCs which includes social and environmental costs. However, current guidance severely constrains environmental valuation. As a result, the current economic rationale for selection of schemes is largely determined by the risks posed to companies' security of supply and the financial costs of building infrastructure (Capex) and moving water (Opex).

In its response to our consultation, Thames Water points out:

> "*The driver for greater interconnection and water transfer is clear: water must be cheaper in water abundant areas and more expensive in water scarce areas. The same economic rationale would drive abstraction licence trading. …a trading market that includes abstraction licensing would facilitate the development and growth of scarcity pricing and help to reveal a real value for water. This in turn would provide the right economic incentives to identify where inter-catchment water transfer might be the most efficient solution.*"

The WRMP process could facilitate an early approach to water scarcity pricing. The process already includes assessment of the shadow price of carbon within

the appraisal and selection of schemes. This approach could be adapted to develop an indicative shadow price for water scarcity based on the Agency's CAMS / WFD assessments.

However, with the exception of WRSE, the WRMP process is a largely insular, within-company process. As a result, stakeholders suggest that the process risks overlooking potentially beneficial conjunctive resource management opportunities between companies. This is particularly the case in the South East. WRSE has shown that better information and information sharing between companies along with improvements to modelling to determine regional- and company-level costs and benefits is required. Companies have suggested these changes and the required outputs would be better delivered by independent specialists, funded either by Defra as the main sponsoring body or through a special venture vehicle.

Sustainability, Carbon and Climate Change

The supply-demand planning processes take account of the environmental, social and carbon costs in the appraisal of feasible options (notwithstanding the comments above in relation to water scarcity); interconnectivity schemes are treated no differently from any other option in that respect. Where an interconnectivity scheme is selected as a preferred option, some companies will specifically carry out further assessment of the potential vulnerability of the scheme to asset stranding. Companies cite possible reasons for this including potential volatility due to changes to energy costs or the cost of carbon. Significant changes in energy cost can severely impact on companies' financial performance; Sutton and East Surrey Water appealed for an interim increase in its price limits in 2009. The cost of carbon has a limited impact on scheme costs at the moment; companies' focus is primarily targets for reducing carbon emissions. However, the impacts of the Carbon Reduction Commitment (CRC) also need to be considered.

In the lead up to PR09, the final details of requirements of the CRC were not available for Ofwat guidance. However, in response to questions from Thames Water seeking clarity on the application of the CRC, Ofwat's response stated that "The CRC is a mandatory carbon reduction and energy efficiency scheme. We consider that for companies to be properly exposed to the scheme's incentives that customers should not bear the financial costs of the scheme. We have therefore not included these costs." Ofwat's response indicates that the carbon costs associated with any scheme should be the responsibility of the company and should not be passed on to the customer, at least under the current determination of prices. In the case of interconnectivity schemes then, current Ofwat interpretation would indicate that any CRC carbon costs associated with making a bulk supply export should be the responsibility of the exporting company and cannot be passed through to the customer, in this instance the receiving company. In having to accept the CRC costs, the donor company is

effectively subsidising the carbon costs of water to the receiving company. This does not preclude companies passing on any financial costs, as they would with any other overhead, but the responsibility for carbon falls firmly to the producer in this case the exporting company. In the short term, the cost of carbon is unlikely to have a significant impact on company decision making. However, in assessing the longer term cost implications, the risk of the cost of carbon increasing significantly is such that the financial burden could be significant. In addition, companies will be looking closely at their positions within the league tables and the significance of this additional burden on top of many others (e.g. the costs associated with the adoption of private sewers).

Practical

Practical barriers to transfers can be identified under a number of headings. Different types of barrier may apply to different types of transfers. Here it is important to distinguish between historic infrastructure and agreements from before privatisation and those that have been created under the current regulatory regime. Some historic agreements are the result of legislation; for example the Great Ouse Water Act, 1961, the South Essex Water Act 1935 and the subsequent Hanningfield Water Order 1950.

Practical barriers to the further implementation of transfers come at both the planning and operational stage of water resource planning. There could also be opportunities for creating environmental benefits from using existing water resources that are surplus to water supply requirements.

Planning

As noted earlier, the approach to long-term water resource planning is set out by the EA in the WRPG and in its Water Company Drought Plan Guideline 2005 (Version 2.0, October 2005). The WRPG includes specific instructions on how uncertainties and risks to the supply demand balance should be considered. One of the main uncertainties in the recent water resource planning round identified by water company practitioners relates to possible changes to abstraction licences, in terms of volumetric reductions, when reductions might be introduced and how alternative options to mitigate the reductions might be funded. The next cycle of review and re-issue of Drought Plans is about to start, so there is relatively limited recent practical experience of drought planning that has emerged from the consultation undertaken for this project. There are however some general themes that emerged.

The main area of uncertainty expressed by water company practitioners relates to the security of supplies where abstraction licences may either be time-limited or subject to sustainability reductions to meet environmental drivers. Under the heading Sustainability Reductions, Section 6.2.1 of the WRPG states that:

"In time, we will make changes to the conditions of individual licences to ensure we adopt the sustainability reductions. We will do this in close consultation with the water companies to maintain security of public supplies."

Section 9.3 states under the sub-heading Time limited licences that:

"Although the headroom methodologies make allowances for uncertainty due to this risk and also the risk from sustainability reductions, we do not expect companies to include these in the calculation of headroom. Ministers have instructed the Environment Agency to ensure that time-limited licences do not present a risk to security of supply. This means that any notice given will provide sufficient time to restore the supply-demand balance based on the accepted level of service. Therefore, any actions can be part of a planned process and there is no need for a headroom allowance for this eventuality."

Although there is a clear commitment to maintain security of supplies, water companies perceive that there are considerable uncertainties in the security of the resource base. Indications of indicative and then definitive sustainability reductions were issued to water companies by the EA over the period from May 2007 to December 2008. This led to considerable uncertainty during the preparation of the draft and then final WRMPs. Experience of the PR09 planning round suggests that the priority has been to mitigate the risk to the company's own customers, with exploring opportunities for new bulk transfer and indeed maintaining existing transfers having much lower priority.

There has also been uncertainty about how infrastructure and other options for mitigating the impacts of sustainability reductions would be funded either through price limits or through the compensation route under Section 52 of the 1991 Water Resources Act. An explanation of this is given by Defra in its letter "Dealing with Unsustainable Abstractions" addressed to water company Regulatory Directors in October 2007.

A further source of uncertainty arises from a mismatch in the timescales of the different planning processes that apply to water resource planning; the three strands are the Water Framework Directive (WFD), CAMS (Catchment Abstraction Management Strategies) / Restoring Sustainable Abstraction (RSA), and the AMP Periodic Review. A summary of the key timelines for the next regulatory cycle is given in Figure 3.1. The CAMS/RSA cycle is more aligned to the WFD cycle. The Figure illustrates that preparation for the AMP6 regulatory submissions (assuming that the process will be similar to that for PR09 – which is currently under review) will start before the EA draft Licensing Strategy is published in December 2012. Water company water resource practitioners may again feel that uncertainty surrounding future changes to abstraction licences will

remove any incentive to develop new inter-company transfers as options to maintain the supply demand balance.

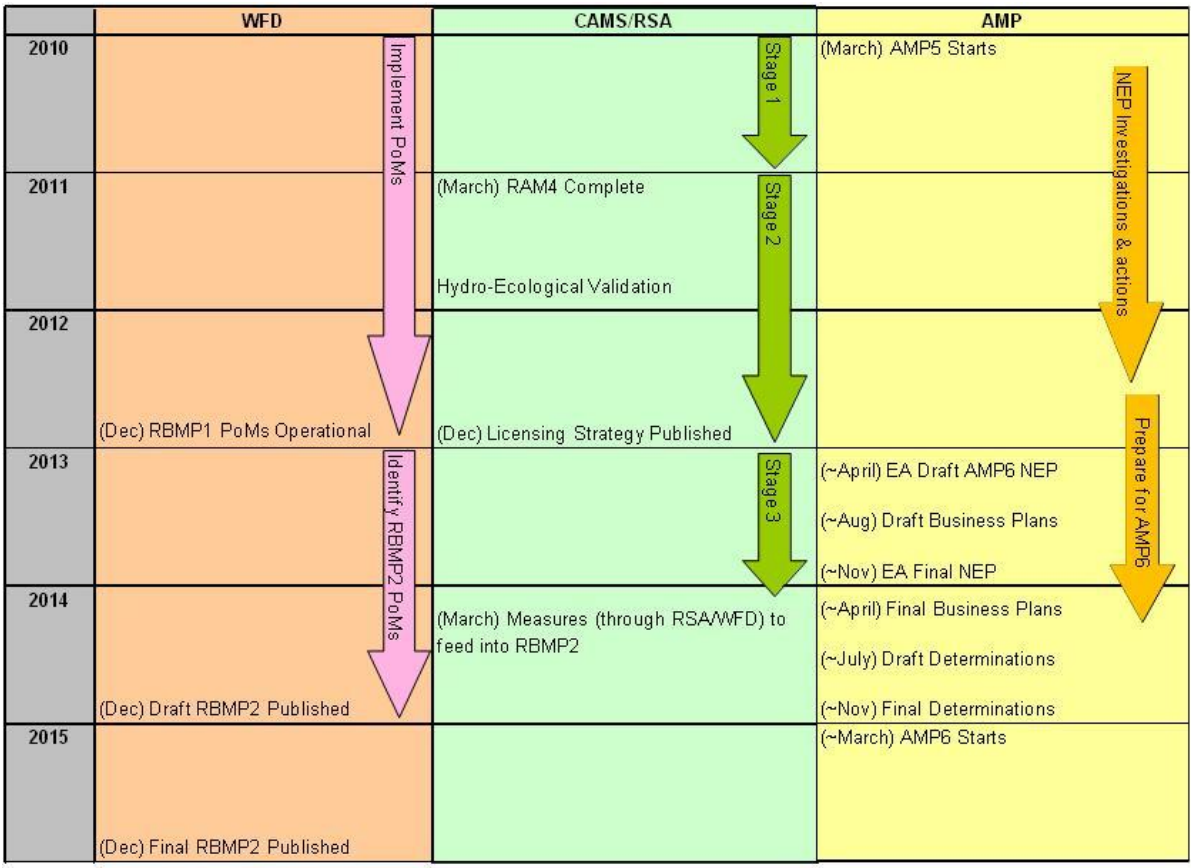


Figure 0.2 – Summary timelines for the next regulatory cycle

Infrastructure and operations

Water Resource Zones (WRZ) are determined to a large extent by geographical features such as river catchments, and the historic development of water supply and distribution infrastructure. With major conurbations located in lowland areas this means that trunk mains and distribution infrastructure is most dense and has the highest capacity away from WRZ boundaries. Companies have tended to develop largely regional / district networks which generally decrease in pipe size as they radiate out towards company boundaries. The Thames Water to Essex transfer is west to east and all the infrastructure is sized accordingly. As a consequence, there is limited scope for interconnectivity without significant investment in major new infrastructure.

Under normal operating conditions when demands are lower than peak and resources are plentiful, there may be no need for the interconnections to operate, so the infrastructure may not be in regular use. The more extreme conditions when an interconnection is required are likely to be experienced by both the

donor and recipient. When operational difficulties arise, then it is likely that the donor company will devote resources to resolve any short-term outage and meet its obligations to its own customers as first priority. Whilst failure to meet supply obligations can be specified in the legal terms of a bulk-supply agreement, the recipient may perceive that under the design conditions when the supply is needed, that there is an increased risk to the security of that supply. This is another disincentive to explore new bulk supply as part of the WRMP process.

The imposition of restrictions on customer use under drought conditions is widely accepted as a legitimate water resource planning response. Different companies do however plan and operate to different customer levels of service. This leads to perceptions as well as examples of inconsistency. Some historic agreements do not include any requirements for restrictions to be applied to customers in both the donating and the receiving WRZ. In the 2005-2006 drought there was an example of the donor company having to maintain its contracted bulk supply, to apply for a Drought Order to relax compensation flows from the storage reservoir, and to impose demand restrictions on its own customers. The terms of the agreement meant that the receiving company was not obliged to impose restrictions on its own customers, nor was it obliged to reduce its take under a "shared-misery" arrangement.

Environmental

There is a practical example where a change to the operation of an existing storage reservoir could provide environmental benefits and at the same time provide additional raw water to supply the water treatment works of another company. The current capacity of the reservoir is greater than the existing requirement of the owner and operator. Although there is no environmental programme driver, water could be released into a natural water course and abstracted by another company to feed its existing water treatment works. Such an option would:

- Make better use of existing infrastructure.
- Increase river flows, though at present there is no environmental driver to do so.
- Defer the requirement for a new option to provide a secure raw water source for existing infrastructure.

This would however require a new discharge consent, abstraction licence, and operating agreement through which the owner of the reservoir could be incentivised to develop such an option.

Customer Impact

The potential for impact on services to customers is a critical issue for companies, particularly concerning a company's ability to maintain levels of service. Companies' security of supply obligations discussed in Sections 2.5.2, 2.6.4 and 3.3 lead to the following positions being taken by companies in considering interconnectivity schemes:

- Supplier Company: is unlikely to maintain full supplies if supply restrictions were being applied to customers in the zone sourcing the supply.
- Receiving Company: is unlikely to accept any restriction on its entitlement to an agreed supply, except in the most severe circumstances.

In both cases, the implied increase in levels of service would increase cost which would be a material consideration in appraising the scheme against alternatives. As an example of this potential situation, Severn Trent referred to its Wing bulk supply arrangement with Anglian Water. Levels of service are not specifically reflected within the agreement, so it is possible that a drought situation could arise where Anglian is required to impose restrictions on its customers and at the same time continue to export to Severn Trent which has a higher standard of service.

Related to this, companies are keenly aware of the impact of such supply arrangements on their customers' perception of the service they are provided. Adverse PR can be created as a result of stakeholder expectations and perceptions, particularly during droughts when customers may be affected by restrictions whilst supply arrangements remain in place to neighbouring companies. Similar issues have been identified where customers perceive a transfer arrangement is being made at the expense of their local environment. These concerns can impose local constraints which, if not effectively managed by companies, can adversely affect schemes through application for consents, environmental lobbying etc.

There are also practical aspects of transfer schemes that can have implications for customers and customer complaints, particularly where waters are mixed which can result in various issues including changes in hardness, discolouration, taste and odour. This can occur through a variety of reasons:

- When chlorinated and chloraminated waters are mixed.
- When softer water is introduced into a distribution network, changing the stability of the water chemistry, leading to mobilisation of iron deposits and discolouration of supplies.
- Interaction with domestic plumbing systems, releasing lead or zinc.

Where companies have traditionally operated combined supply systems where waters of differing qualities are blended and then supplied to customers, this

doesn’t present a significant issue. There are, however, cost implications which should be evaluated within the supply-demand investment appraisal processes. Additional costs to companies may also arise where they are required under statute to soften water or to fluoridate as a result of local health requirements.

Table 0.2– Summary of consultation feedback

Barrier / Constraint	Consultation comments	Influence on decision making (H, M, L)
Regulation & Finance		
Economic Regulation		
Lack of return on investment in bulk supply assets inhibits their development and use	Limited return on investment (5 years) together with Opex efficiencies are significant disincentives to companies. The majority of companies indicated that more opportunities for interconnectivity and sharing of resources might be evaluated if the financial regulatory framework allowed a more favourable return on investment. Despite arrangements put in place for the 2004 Review, there is limited incentive to companies to enter into interconnectivity arrangements. As a consequence, Ofwat is currently considering alternative approaches which will allow companies to retain the benefits of investment in interconnectivity schemes, potentially through a price cap mechanism. There may be limited financial benefit to receiving companies from investment in infrastructure assets.	Medium - High
Supply charges and risk of uncontrollable increases in Opex	The inclusion of bulk supply costs to the receiving company within Ofwat's efficiency model means that the costs can present a significant uncontrollable risk. By contrast, the costs of providing the bulk export are excluded from the efficiency model. Ofwat may grant companies a "special factor" allowance but only if the costs of bulk supply imports exceed 1% Opex.	Medium - High
How easy / difficult is it to obtain funding for intra-company transfers?	PR09: Ofwat has approved expenditure on interconnectivity schemes where need and cost-benefit were adequately justified and supported e.g. AWS resilience schemes involving strategic mains connections between previously separate supply systems.	Low
Could Ofwat role in determining bulk supplies be better defined / delivered?	Large majority of existing bulk supply arrangements were in place prior to privatisation, so effectiveness of Ofwat role has not been a significant issue. For those companies who have requested Ofwat to determine terms, this has included consideration of cost; the interruption, restriction or suspension of supplies (based on *equal misery*); and, periodic review of the agreement and terms. In other instances (in relation to new inset appointments), determination has been a very slow process with one case still outstanding after 18 months.	Varies significantly between companies
Finance		
Is the cost of bulk supplies a disincentive?	Where a bulk supply is one of a number of feasible options for maintaining the supply-demand balance, the associated Capex, Opex and external costs are evaluated to determine relative cost-effectiveness and so absolute costs are not critical. Operating costs will influence Opex and relative efficiency assessments (above).	Low
Commercial viability: can sufficient profit be made?	Will vary in relation to the requirement and nature of agreement between companies. Where agreement on terms cannot be reached, companies can request Ofwat determine under Section 40, WIA.	Will vary with circumstance

Does the 5 year restriction on revenue benefits constrain development / use?	Impact will vary depending on nature of bulk supply agreements. Will benefit short term contract arrangements. Where long term contract arrangements are required to justify involvement, revenue will be included in the Price Review after 5 years. Where revenues rise, higher base revenue and lower K factors will result, limiting the potential benefit to donor companies.	Will vary with circumstance
Transparency: is the lack of consistent cost/benefit data a barrier?	Limited scope for any significant differences in Capex and Opex of schemes. However, AISCs may vary significantly between companies due to flexibility in the guidelines around key concepts and best practice. This has proved to be a significant issue of contention in WRSE leading to more fundamental disagreement on proposed schemes to deliver a more integrated strategy. There is a need to ensure consistency of approach by companies is given to all schemes, including those that may not be preferred. There is an opportunity through the WRMP for better pre-plan discussion / sharing of information to ensure transparency. Costs are distorted by the variation in abstraction charges between regions which are based mainly on cost recovery and do not reflect what many see as the "true value" of water or "water scarcity". A number of consultees felt that until there was a clear driver for water scarcity – *water being cheaper in water abundant areas or more expensive in water scarce areas* – the incentives for interconnectivity schemes would be limited.	Medium High
Environmental Regulation		
'Need' for abstractions: is there a perception of EA preference for resources to be developed and used within catchments / supply areas?	Perception of some regional differences in approach to licensing; however, generally Agency water resources strategies clearly point to potential interconnectivity schemes (e.g. WRSE). There are a number of examples of existing schemes where sources have been developed out of region e.g. Rutland Reservoir. Where companies can demonstrate need for "out of area" resources to support interconnectivity schemes, the Agency's approach to licensing should not be a significant constraint.	Low
Planning and consents: are there similar "within area" constraints?	There will be a range of local planning and consenting issues but these apply equally to all schemes being considered by companies. Specifically in the case of interconnectivity schemes, public perception and concerns regarding resources being transferred out of catchment may lead to some local pressures but where a scheme can be justified on need and environmental grounds this should be manageable by the company and should not be viewed as a significant barrier.	Low
WFD: do the regulations present a barrier?	Application of the WFD regulations could impede the development and use of inter-basin transfers and new environmental standards may impose significant challenges. However, established guidance on approaches to evaluate the potential for impact on ecological condition should allow companies to identify critical issues, the need for additional monitoring and analysis and consideration of alternatives. The principal risk is the potential impact on timing of implementation of schemes within companies' supply-demand strategies, which can be managed through a robust WRMP process together with targeted scheme investigations. As a result, consultees do not see this as a critical constraint.	Low

Planning Framework		
Carbon & Energy		
Significant pumping costs: are energy / carbon costs a significant consideration or constraint?	Energy and carbon costs are a key consideration in the appraisal of options through the supply-demand planning for companies WRMPs. Whilst the significant pumping requirements of interconnectivity schemes will impact on carbon and energy costs, schemes should be treated no differently from any other option in the appraisal process. Where interconnectivity schemes are selected as a preferred option, the potential risks of exposure to volatility of energy costs or the costs of carbon have led some companies to undertake additional assessment of their vulnerability to asset stranding. The potential implications of the CRC will be important. The CRC places the responsibility for carbon firmly with the producer, in this case the 'exporting' company. The immediate costs of the CRC cannot be passed on to the receiving company; they are in effect viewed simply as another customer. Ordinarily this would ensure that there is an incentive on companies who can directly act to reduce energy and emissions although in this context the boundaries are blurred in terms of incentive to manage demand versus the producers' incentive to reduce its energy and carbon costs. However, there is no constraint on companies including some allowance for CRC costs as an overhead within bulk supply costs where that is agreed between the parties concerned. Some companies have suggested that the CRC effectively requires the donor company to subsidise the CRC costs of the receiving company. Currently the costs are low; however, the risk of the cost of carbon increasing significantly is such that the financial / regulatory burden could become a material constraint to companies investing in interconnectivity schemes.	Medium High
Security of Supply (SoS)		
Supplier of last resort: how important is this in assessing feasibility of interconnectivity options?	Meeting security of supply obligations is a critical issue for companies; customer expectations of companies to maintain supplies "in almost all circumstances" is a key driver for investment in schemes that provide guaranteed supply. As a result, reliance on interconnectivity schemes requires companies to manage supply-demand risks in their systems to very low levels, requiring suppliers to ensure their resources were unrestricted. Many existing schemes acknowledge the impracticality of this level of security and include clauses for reducing supplies in droughts. As a result, they do not provide a secure supply.	High
SoS Index (SOSI)	Companies' concerns particularly relate Ofwat's use of the security of supply index (SOSI) to hold companies accountable for meeting standards of service, and taking action where companies fail to achieve SOSI	
Are differences in levels of service (LoS) likely to impede development / use?	Companies unwilling to accept any restriction on entitlement to agreed supplies and increasing reluctance to accept schemes which may be operated at a lower LoS. Maintaining LoS through shared supplies are likely to increase scheme costs.	High
Are differing views on assessment of deployable output (DO) likely to be significant issues?	Ordinarily DO and LoS would be agreed between companies and reported accordingly within each company's supply-demand balance, and audited by the Agency and Ofwat. Under normal circumstances there should be little reason for any reporting differences between companies. The exception to this arises where suppliers may need to review the DO of the scheme following experience of drought conditions far worse than those originally planned for and / or where changing guidance indicates that DO should be assessed over a much longer modelled period. Where this has occurred, this has resulted in a significant change to the volume supplies companies can rely upon compared to that formally agreed, which can then impact on the SoS status and supply-demand balance of the receiving company.	Low High

WR Zones: would these need to be redefined? Is that an issue?	The recent WRMP process has highlighted differences of views about the definition of WR zones as a result of ambiguity in the definition of a WR zone in the Agency's Guidelines. This could create difficulties in gaining regulatory approval and, therefore, delays in implementing new schemes. Companies who have addressed this issue see advantages in underpinning the need for schemes to maintain security of supply and supply resilience, including infrastructure connectivity within and between zones.	Low
Is abstraction licence uncertainty an issue when considering development and use?	This is a critical risk to companies. Apparent lack of consistency between the Agency's resource assessments that underpin WFD and CAMS compared to guidance on sustainability reduction schemes which should be included in the WRM process leaves companies with significant uncertainties about their resource base, their supply-demand balance and the nature (and timing) of their future resource requirement. This has a direct effect on companies' consideration of opportunities for interconnectivity and resource sharing. It may also lead to licence variation in connection with existing schemes, resulting in risk of stranded assets. Proposals to time limit abstraction licences will increase uncertainty over water availability in some areas, creating further doubt over the feasibility of interconnectivity schemes.	High
Does the WRMP Framework impose barriers or constraints on companies' approaches?	With the exception of WRSE, the WRMP process is largely insular, within company, potentially overlooking conjunctive resource management opportunities between companies. The issue is more important in the south east than elsewhere. However, improvements would require better information / information sharing between companies and modelling improvements to determine regional- and company-level costs and benefits.	Medium
How would the occurrence of extreme events affect your views?	The benefits of interconnectivity (to security of supply) in extreme events are being addressed by companies through resilience programmes. Impacts of drought can be significant as referred to above.	Medium
Risk Aversion		
Planning new schemes / Inquiries. Would restrictions on commercial arrangements affect your views of feasibility?	For some companies the question of whether interconnectivity schemes should be developed as a single owner or jointly with others does not arise – they are willing to consider either depending on the nature of the opportunity. However, a number of companies would prefer to see opportunities for joint ownership. In one specific instance, we are aware of legal opinion that single company promotion (compared to JV) stands a greater chance of success where the scheme is likely to be referred to an inquiry. At the same time, this can undermine commercial trust on any subsequent opportunity for resource sharing from that scheme.	Varies significantly between companies
Ownership / risk: is there a preference towards ownership?	For the reasons set out above, there is a general preference toward ownership of assets rather than reliance on a supply agreement to ensure, and manage risk exposure to, security of supply. Where ownership is not an option, there are few incentives to develop interconnectivity schemes.	High

Is the basis for legal agreements on supplies a constraint?	The view that the 'bulk supply is only as good as your lawyer' reflects lack of confidence in the guarantees of reliability during drought conditions. Supplier companies' own obligations will lead them to place their own customers' requirements first. Companies demanding guaranteed supplies would need to consider the likely impact on costs, the requirement for a very challenging due diligence assessment of the supplier and scheme, and, the management implications of operating such a scheme.	Medium
Is changing source quality an issue?	Potential risks to supply and quality failure where donor source quality deteriorates (e.g. pesticide contamination).	Low
Does competition present a barrier?	Exposure where companies invest in infrastructure improvements to make bulk supplies; neighbouring companies may see a competitive entry advantage	Low – Medium
Customer		
Are taste and odour, softening requirements etc likely to affect the feasibility?	Practical and therefore cost issues and implications to customers when waters are mixed. Some companies are required to soften under statute or fluoridate under local health requirements, imposing additional costs on the receiving company. Other issues include: taste and odour when chlorinated and chloraminated waters are mixed; mobilisation of iron deposits and discolouration of water as a result of the introduction of softer water, and potential release of lead or zinc from domestic systems.	High
Do differences in levels of service and customer reaction influence your views?	Customer perception and expectations of supply reliability from transfers when own supplies are affected by drought. …*[example headlines such as] Water Company imposes hosepipe ban but continues to profit from providing water to neighbouring company* …"	Medium

Options for Change

Potential options for change have been tested with stakeholders in a workshop environment where the main barriers and constraints were reviewed and potential mitigation measures tested to draw out indicative priorities, potential benefits and business risks, and to identify where further action or development might be required.

A key question in prioritising options is whether progress is best achieved by duties or by incentives. There is no simple either/or solution set; the balance and merits of measures that rely on duties or incentives should be considered. In many instances, incentives to companies may translate into costs to customers. As a result, the more barriers can be removed, the better as fewer incentives will be required leading to lower cost to customers.

A range of potential options have been identified to mitigate those barriers and constraints considered significant by stakeholders. These are summarised in Table 4.1 and described briefly below.

Economic Incentives

A number of potential economic regulatory incentives have been identified through consultation with stakeholders over and above those already in place (Section 2.5.1) to rebalance Opex and Capex incentives through the regulatory process. These could include:

- A once off adjustment to RCV to reflect the assets "notionally owned" by a company receiving a shared supply. This could in part address the disincentive to receiving companies.
- Removal of the truncation of benefits to supply companies, providing a mechanism whereby both company and customer can benefit over the term of the supply agreement.
- Removal of all or part of the Opex costs associated with receiving bulk supplies from the Ofwat efficiency assessment to remove the unintended penalty on receiving companies.
- Removal of the price cap, taking Capex and Opex costs associated with bulk supplies out of the price review process to allow companies greater freedom to trade and share resources.

Removal or changes to the price cap would allow companies engaged in interconnectivity schemes to jointly benefit, allowing the supplier to retain revenues and avoiding unintended disincentives on receiving companies through efficiencies imposed on uncontrollable Opex costs. We understand this is one of a number of options Ofwat is currently evaluating with a view to consultation later

this year as one element of its approach to encouraging commercial trading and competition. Although Ofwat has already made some adjustments within its regulatory approach, changes of this order may require more fundamental changes to companies' licence. There are potential issues around how Ofwat could manage any significant windfall to ensure customers also benefit. That said, Ofwat has recognised the potential benefit for the environment which could help avoid environmental costs to companies and customers to redress sustainability issues. Any such change would require a change in legislation. Given these stages, significant changes to regulatory approach are unlikely to be in place within the next 5 years.

Guidance and Directions

A key concern to stakeholders is the impact of licence uncertainty on WRMPs and companies' investment decisions. There is a perceived gap in current guidance from Defra and the Agency in terms of the planning framework to effectively respond to the risks of licence uncertainty. In the case of schemes included within the National Environment Programme, the Agency should consider providing companies with clear guidance around the likely timing of a reduction in licence and provide a much more robust framework for companies to plan for the risk of a reduction in licensed quantities so that they can plan accordingly. Equally, companies will need to identify clearly to the Agency the nature of risks to customers and the impact on decisions concerning arrangements for interconnectivity and resource sharing. This will help identify where interconnectivity may be feasible but is constrained (in the timescale of the agreement that can be made) by potential licence reduction.

A number of companies have raised concerns regarding the reliability of supplies via interconnectivity schemes and the risks thereby imposed on their security of supply obligations as effectively imposing a constraint on their consideration of potential schemes. This is compounded by Ofwat's use of the security of supply index (SOSI) in holding companies accountable for meeting their declared levels of service. This has led some to suggest that a review of the security of supply obligations on companies should be undertaken. This is likely to be a necessary precursor to any development of trading as well as more effective development of interconnectivity and sharing of resources, particularly in the South East as discussed in Section 3.3. The scope of this review is not intended to change companies' obligations but to clarify what those obligations are against companies' own interpretations and to identify the degree of flexibility available to companies in meeting those obligations. The outcomes will inform any development of model agreement for supply as well as consideration of the reliability and risks around potential interconnectivity options.

In addition, the issue of interconnectivity raises a more fundamental question around levels of service and whether there would be benefit from application of

consistent standards across the industry rather than base reference standards chosen by each company independently. This would help address a number of issues including customer perception / expectations as well as standards of reliability of interconnectivity schemes.

Other potential changes within current Guidance and Directions focus mainly on issues around the availability and transparency of information upon which stakeholders can make informed judgement of the potential for interconnectivity and sharing of resources.

Companies' published scheme option AISCs have only recently been subject to audit as a result of the requirement to publish WRMPs. This has raised a number of questions about companies' approaches and assumptions, in this context to estimating the AISC of options and whether they are comparable between companies. It was generally agreed amongst stakeholders that they were not. However, the currently published data still provide a useful yardstick of costs and potential resource quantities available.

This leads to two recommendations for potential change in approach within the current regulatory guidance to companies:

- Regulatory requirement on companies for early and proactive investigation of potential options for interconnectivity and resource sharing. This will require greater collaboration between companies and with regulators to ensure that the assessments are robust and open to scrutiny. WRSE provides a good example of where this process has been put in place, although there remain issues around consistency and confidence in the data and therefore strategy outcomes. There was a suggestion from some stakeholders that the Agency has not exercised its powers sufficiently under Section 20B of the WRA (see Section 2.2). Through use of these powers and Defra Directions to the companies in advance of the WRMP cycle, the Agency could actively encourage an early step in the WRMP process, requiring companies to liaise and then report on their assessment of potential interconnectivity options, costs and issues.
- This would require companies to expose details of their current supply-demand balance, the marginal cost of supplies from sources where they may have surpluses and to agree potential scheme requirements and costs at a resource zone level that would enable other companies to share or provide spare resource capacity. Acknowledging that the full process may be commercially sensitive, the latter step may require companies to invite costed expressions of interest to supply.

A key outcome from these recommendations would be a potentially broader assessment of options than is currently carried out by companies for their WRMPs supporting selection of the most economic of those environmentally

acceptable schemes shortlisted. This would go some considerable way towards meeting the intention of Cave's proposed Economic Purchasing Obligation. It is also relatively quick and straight forward to implement within the current regulatory framework.

In this way, the process remains in control of the companies. By contrast, some stakeholders have suggested that a more robust approach to assessing the availability and feasibility of greater interconnectivity would be better undertaken by an independent body who can provide both the necessary specialist expertise (engineering, water resources and economic modelling and appraisal etc), perhaps sponsored by the regulators and reporting to Defra. This could be based on development of the modelling approaches used by Ofwat and WRSE to asses resource availability and identify options. It would also provide a sensitivity test around companies' WRMPs, accepting that companies would still need to make their own commercial judgements on investment. This could help to address the divergence of opinion expressed currently regarding the scope for interconnectivity and concerns regarding the shortcomings of assessments within WRSE.

A potentially significant constraint is emerging as a result of Ofwat's interpretation that the CRC carbon costs associated with making a bulk supply export should be the responsibility of the exporting company; the donor company effectively subsidising the carbon costs of water demand by the receiving company. The cost implications of the cost of carbon increasing significantly are such that the financial burden could be significant to supplier companies. The interpretation of the CRC should be reviewed to ensure that it does not create unintended consequences and as a result impose new barriers on interconnectivity.

Shadow Price of Water Scarcity

The development of a clear price signal of the "true value of water", reflecting pressures on the environment and water scarcity - water being cheaper in water abundant areas and more expensive in water scarce areas - could provide a significant driver for interconnectivity and sharing of resources. The development of a trading market that includes abstraction licensing may also facilitate the development of scarcity pricing, revealing the real value for water and providing better economic incentives to identify where inter-catchment water transfer might be the most efficient solution.

The WRMP process could be easily adapted to facilitate an early approach to water scarcity pricing. The WRMP Guidance already includes assessment of the shadow price of carbon within the appraisal and selection of schemes; this approach could be adapted to develop an indicative shadow price for water reflecting scarcity as indicated in various Agency assessments e.g. CAMS, WFD etc.

Some early work would be required by Defra and the Agency to define the concept of scarcity and undertake some initial econometric exercise to identify the potential range of valuation that may required to impact on decision making.

This could help identify alternative ways to fund environmental improvement, overcoming current constraints on the Agency as a result of the level of potential compensation requirements, limitations of cost recovery of the Agency's functions and Treasury concerns of potential debt implications.

Bulk Supply: Model Agreements

A further opportunity has been identified in discussion with Ofwat regarding concerns raised by companies around contractual agreements and reliability of supplies via interconnectivity schemes.

Development of a regulated model contract for interconnectivity schemes would help to address concerns raised by some companies regarding their arrangements only ever being as good as the agreement. A model contract, perhaps developed in agreement between Ofwat, the Agency and companies, could be implemented where companies cannot agree commercial arrangements or perceive the commercial and customer risks of reliance on a particular scheme to be too great under current arrangements.

The development of a Model Agreement would also need to reflect any actions identified as necessary to address companies' concerns regarding risks to their security of supply obligations and how SOSI is implemented (see Section 4.2).

Mergers and Competition

A potentially important and beneficial option is the opportunity provided through water company mergers, potentially making intra-company transfers more attractive because the issue of transaction costs is removed, overall costs are much more controllable and there is no risk transfer from one company to another; risk is managed within the company's approach to infrastructure investment and conjunctive management of its resource-supply system. The current regulatory approach to commercial competition and the use of inter-company comparators essentially inhibits mergers and could create a constraint to interconnectivity. This assumes that, with all other issues remaining the same, companies will continue to perceive unacceptable business and customer risks arising from reliance on supplies through interconnectivity schemes.

Competition may help and hinder. The issue of companies exposing their networks to competitive entry indirectly, as a result of investing in infrastructure to receive a bulk supply needs to be carefully considered.

The development of upstream trading may provide some benefit, particularly where it is accompanied by parallel development of an environmental value

reflecting water scarcity. However, responses by a number of stakeholders to the consultation suggested that current assessments of upstream trading may be flawed and significantly overestimate the potential benefits because they have not taken proper account of the resources available within individual resource zones.

Cost transparency does not sit easily with the concept of trading; the approach to interconnectivity, therefore, will either be collaborative or market driven but is unlikely to be a mix of both. Promotion of trading too fast, too early, may well create a new and more significant barrier to interconnectivity unless the commercial imperatives to do so are considerable. That is, unless in the short term an approach can be developed in which a shadow price of water scarcity can significantly influence companies approach to risk and decision making.

Building trust and confidence

Through our consultation for this report stakeholders have emphasised the importance of providing a framework that builds trust and confidence between all stakeholders. Regulators will need to provide an effective lead, encouraging transparency and providing greater clarity around abstraction licence uncertainties created by the National Environment Programme to help companies identify whether potential interconnectivity schemes are viable. Other issues referred to above will provide a much firmer framework for engagement between companies, providing greater transparency of resource requirements, availability, costs and terms to underpin further commercial discussion.

Table 0.1 – Potential Mitigation Measures

Barrier / Constraint		Significance	Mitigation
Limited return on RCV	Lack of returns on bulk supply assets for the recipient	High	Provide a one off notional adjustment to the RCV so the assets is notionally owned and a return is achieved
	Limited incentive to offer supply, either existing or new, as revenues are reset every five years	High	Provide a mechanism by which the donor company retains the revenue (above the cost of supply) for the duration of the agreement.
Impact of Opex Efficiency	Uncontrollable costs of shared supply	High	Remove all or part of the operating cost associated with the bulk supply from the efficiency assessment
Imbalance of Opex and Capex	Impact on Price Review	High	Removal of the price cap, taking Capex and Opex costs associated with bulk supplies out of the price review process would allow companies engaged in interconnectivity schemes to jointly benefit and provide greater freedom to trade and share resources.
Security of supply obligations	Duty to supply own customers out ranks contractual obligations relating to the bulk supply, increasing uncertainty for recipient over security of supply.	High	This would require a change to legislation to expand the remit of the duty. This however may not be necessary if the other incentives to trade are strong enough. Review to clarify obligations against companies' interpretation and to identify the degree of flexibility available to companies in meeting those obligations. Is likely to be a necessary precursor to development of trading as well as more effective development of interconnectivity and sharing of resources.
Licence uncertainty	Proposals for time limited licensing. Planning for sustainability reductions to licences	High	Reduce uncertainty with respect to sustainability reductions and other regulatory driven restrictions on supplies / address gap in current guidance from Defra and Agency in terms of the planning framework to effectively respond to the risks of licence uncertainty. Requires much more robust framework and timely guidance for companies to plan for the likely timing and potential reduction of licence quantity, identify the nature of risks to customers and the impact on company decisions concerning arrangements for interconnectivity and resource sharing to identify where interconnectivity may be feasible but is constrained in time by potential licence reduction.
Transparency of assessments	Transparency and consistency of approach to scheme costs and estimates of resource availability at resource zone level.	Medium / High	Requirement for early proactive investigation of options as part of the WRMP process. Where necessary, use of powers under Section 20B of the WRA to direct companies in advance of the WRMP cycle, requiring companies to liaise and then report on their assessment of potential interconnectivity options, costs and risks. Companies to expose details of current supply-demand balance, the marginal cost of supplies from sources where they may have surpluses and to agree potential scheme requirements and costs at a resource zone level to identify where schemes may be feasible or constrained by other factors.

"True price" of water	Impact of water scarcity	High	Development of scarcity pricing to provide economic incentives to identify where inter-catchment water transfer might be the most efficient solution. Adaptation of the WRMP process to develop an indicative shadow price for water reflecting scarcity as indicated in various Agency assessments e.g. CAMS, WFD etc. Will require early work to define the concept of scarcity and undertake initial econometric assessment of the potential range of valuation that may required to impact on decision making. Develop a trading market that includes abstraction licensing; this would facilitate the development of scarcity pricing and help to reveal a real value for water.
Risk / failure of bulk supply agreements	"Arrangements only ever as good as agreement"	Medium	Development of a model contract for interconnectivity schemes. (Ofwat, EA).
CRC Cost allocation	Donors subsidising receiving companies	Medium	Review interpretation of the CRC to ensure it does not create new barriers on interconnectivity.
Competition and trading	Cost transparency does not sit easily with the concept of trading	Medium	Companies could be required to expose their water resource needs to the market, without bias, as part of the WRMP process. Companies would offer to the market the deficit they are forecasting, seeking market solutions to meet this deficit and these could include bulk supplies from neighbouring suppliers (assuming the incentives are adequate), new suppliers, water efficiency solutions and other demand management solutions. These options would then be compared to the cost of own supply and the least cost market tested solution could then be applied.

Conclusions and next steps

From the foregoing, the critical barriers and constraints, and opportunities for mitigation of their impact on interconnectivity schemes in England can be summarised as follows:

Constraints:

- Lack of return for the company taking the bulk supply and truncated returns for the company providing the bulk supply.
- Company taking the bulk supply would be penalised under the current regulatory approach (Opex efficiency) for what are uncontrollable costs.
- Increased risk to security of supply obligations from lack of direct control over the activities of the donor water company and provision of reliable supplies.
- Future licence uncertainty with respect to the National Environment Programme and impact of proposals for time limiting all licences.
- Visibility / transparency of supply costs and availability.
- Inadequate valuation of true cost of water, not reflecting water scarcity, limits incentives to trade or transfer.
- CRC cost burden on suppliers through regulatory interpretation of pass through; the donor is effectively subsidising the carbon costs of water demand by the receiving company.

Opportunities for mitigation:

- Review of price cap, taking Capex and Opex costs associated with bulk supplies out of the price review process to allow companies engaged in interconnectivity schemes to jointly benefit and provide incentives to trade and share resources.
- Rebalance Opex and Capex incentives within the regulatory regime:
  - Enable return on investment in bulk supplies.
  - Remove all or part of the operating cost associated with the bulk supply from the efficiency assessment.
- Reduce uncertainty with respect to licence reduction through sustainability reductions and other regulatory measures.
- Seek opportunities through model agreements or other measures to align and improve visibility / transparency of the following in the donor/recipient zones:
  - Levels of service.

  - Management of risk.
  - Operational and capital maintenance requirements.
  - Supply costs and resource availability.
- Develop approach to scarcity pricing to provide economic incentives to identify where inter-catchment water transfer might provide more efficient options.
- Review CRC guidance to companies and unintended consequences on donor companies.
- Develop model case studies of trading to demonstrate requirements and benefits.

A range of potential options have been identified to mitigate those barriers and constraints considered significant by stakeholders. There is no simple either / or solution set; the balance and merits of measures that rely on duties or incentives will need to be considered carefully. From our analysis and consultation with stakeholders, the following conclusions can be drawn:

- The more barriers can be removed, the better. In particular, removal of current financial barriers is a key requirement and forthcoming consultations by Ofwat will be important in establishing what changes can be achieved within the existing regulatory framework to achieve this.
- Incentives could result in cost to customers but overall are likely to be more effective than increasing regulation.
- Better transparency of resource requirements, availability and costs is essential. A number of options have been identified:
  - Publication of AISCs of the next scheme required in each resource zone early in the timetable of the next planning round.
  - A requirement on companies to formally consult with neighbouring companies and to report on that as part of the early development of companies' WRMPs.
  - Acknowledging the full process may be commercially sensitive, encouraging companies to invite costed expressions of interest to supply.

    This would provide a significant step towards, and possibly meeting, Cave's proposed economic purchasing obligation. The process (and final outcome) would need to be integrated into the WRMP process and be fully auditable.
- Companies' security of supply obligations need to be clarified to confirm where potential business risks from interconnectivity schemes may occur. Ofwat's use of the security of supply index (SOSI) as a potential barrier

should also be carefully reviewed. This will be particularly important in any further consideration of upstream markets, such as the proposal to require companies to trade a % of their available resource.

- The issue of interconnectivity raises a more fundamental question around levels of service and whether there would be benefit from application of consistent standards across the industry rather than base reference standards chosen by each company independently. This would help address a number of issues including customer perception / expectations as well as standards of reliability of interconnectivity schemes.
- Development of a Model Agreement for interconnectivity schemes may provide a sounder basis to promote discussion and development of schemes.
- There will be a significant reliance on building trust and confidence between all stakeholders. Regulators will need to provide an effective lead, encouraging transparency and providing greater clarity around abstraction licence uncertainties created by the National Environment Programme to help companies identify whether potential interconnectivity schemes are viable. Other issues referred above will provide a sounder framework for engagement between companies.
- Great care should be taken to assess potential for unintended consequences from any action. Stakeholders expressed concern that reliance on market mechanisms could result in poor outcomes and that the industry would be better to focus first on the development of its duties before looking to the market.
- Some of the potential changes in approach to regulation and industry structure currently under discussion could also help reduce or remove some barriers. There will be an opportunity to feed into forthcoming White papers to ensure opportunities are fully explored.

Moving forward, it will be important to assess potential for unintended consequences of any option, particularly in relation to changes to legislation, Directions and Guidance which may inadvertently create new barriers to interconnectivity.

Drivers

There are a number of drivers for change that may impact on the scope for interconnectivity; these include:

- The Cave Review.
- Future Water.
- Harnessing Upstream Markets (Ofwat).

- The Government's review of the natural environment and its stated intention to publish a series of White Papers of relevance to the water industry over the coming 12 months.

The Cave Review (2009) of Competition and Innovation in Water Markets in England and Wales made a number of recommendations with regard to abstraction licences and the scope for trading which are important here:

- Potential for "unbundling" of the industry structure, disaggregating the current vertical structure of the industry into a new structure of operational service providers, separating bulk suppliers, bulk distribution, network services and retailers.
- Economic purchasing obligation: imposing a legal obligation on companies to procure "best value supplies".
- Publication of supply costs and access prices at water resource zone level based on economic costs and long run avoidable costs.
- Abstraction licensing reform to tackle over-abstraction and facilitate (upstream) trading.
- Development of a water scarcity charge.

With the exception of potential restructuring of water company businesses, many of these aspects have been referred to above. Regulatory reporting is already being developed to inform consideration of unbundling.

The UK Government and Welsh Assembly Government are currently considering the recommendations outlined in the final Cave report.

Future Water (Defra, 2008) sets out Defra's vision for the water sector by 2030 and some of the steps required to get there. Future Water set out the need to examine supply options more strategically and that whilst work carried out by the Agency shows that a national water grid would have significant financial and carbon costs, there may be real opportunities for water companies to work together on a local or regional grid basis to improve the supply-demand balance and the resilience of supply security through greater interconnectivity. Future Water also included proposals to consult on changes to the licensing regime, imposing a time limit on all abstractions by the third cycle of River Basin Management Planning in 2021-2027, supporting further assessment through CAMS of water scarcity, allowing the re-allocation of water and offer opportunities for new abstractors – including new entrants to the water supply market – to gain access to water.

"Harnessing upstream markets" (Ofwat 2010b) sets out Ofwat's view of current regulatory barriers to interconnection and their assessment of the scope for using upstream markets to deliver ongoing efficiencies. Ofwat's assessment indicates

significant savings could be achieved through greater interconnectivity and sharing of resources, of the order of £960M. However, in response to consultation for this report, many stakeholders felt this assessment was an over-estimate and based on potentially flawed, out of date, data. Nonetheless, the report serves to provide a high level indication of the scope of opportunity available and the challenge to the industry to fully consider interconnectivity schemes.

Ofwat (2010c) is also consulting on options to reduce the water supply licensing threshold from 50Ml to 5Ml. As part of its consultation, Ofwat is recommending that companies should publish indicative price information for licensees' customers that use between 5 Ml/a and 50 Ml/a of water a year. Indicative price information will have to be provided for customers that use 5 Ml, 10 Ml, 20 Ml, 30 Ml and 40 Ml of water a year. These new indicative prices will have to be supported by data showing how they have been calculated. Although aimed at a different target market, this requirement of companies is broadly consistent with the recommendations made in Section 4.

Legislative Considerations

There are two key elements of Governments' new legislative programme which may impact on the scope for interconnectivity and which the conclusions of this project might usefully inform:

- At the Future Water 2010 event, on 13 July at the Royal Geographical Society in London, Richard Benyon announced that Defra would be publishing a White Paper, in summer 2011, on reform of the water industry to ensure more efficient use of water and to protect poorer households.
- On 26 July the Secretary of State launched the discussion document – An invitation to shape the Nature of England – which will encourage debate about how best we protect and enhance our natural environment, and the valuable services we derive from it. This discussion document will help shape the Natural Environment White paper which will be published in Spring 2011.

Developing Guidance and Practice

The overall consensus from our consultation with stakeholders is that it is timely at the start of the new 5-year planning cycle to review the current regulatory and planning processes of the water industry. The Government has already published its discussion document and proposals for a White Paper; Ofwat is publishing a series of discussion documents and occasional focus reports; and the Environment Agency has indicated that it will be reviewing its Water Resources Planning Guideline. Consideration of the barriers and constraints to

interconnectivity and potential mitigation options identified in this report will form an important part of these reviews.

Whilst many single issues have been identified in consultation with stakeholders, many of the barriers and constraints associated with these issues could be addressed by a much smaller number of mitigating actions. The need for development of Guidance and Practice has been identified in the following areas:

- Economics and financing: identifying how the financing issues around interconnectivity (and related aspects of upstream markets) may be managed in future.
- Developing a framework for consistency between the different strands of regulatory planning: in particular providing clarification to companies on the key aspects of security of supply obligations and how that will be regulated with greater interconnectivity and models for upstream markets.
- Transparency of information:
  - Requiring companies to:
    - Formally consult with their neighbouring companies and to report on resource requirements / availability, costs.
    - Publish details of available resources and costs, and the AISCs of the next scheme required in each resource zone.
  - Requiring the Environment Agency to provide greater clarity around abstraction licence uncertainties created by the National Environment Programme; and, water companies to identify where licence reductions to meet new obligations could undermine potential interconnectivity schemes and / or where these could be realistically phased over 5, 10 or 15 years in order to provide viable options for resource sharing for agreement with the Agency.
- Development of a Model Agreement for interconnectivity schemes by Ofwat in consultation with water companies and the Agency.

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