Water 2020
Water resources: proposed changes to enhance the scope for innovation and competition

Executive summary

The way that the water sector plans to balance the supply of, and demand for, water has changed little in the last 15 years. The current planning approach has served customers and the environment well during that time, not least in terms of driving leakage reduction and, more recently, greater emphasis on metering and water efficiency. But, it is important that the approach adapts and is fit for the challenges of the future. During the 2010 drought, concerns increased that the existing planning approach did not provide the security or resilience of supplies that customers expect and does not always deliver the best value solutions. Without improvements in the approach, the increasingly complex and difficult challenge of maintaining secure water supplies and delivering the level and quality of service we have committed to deliver for our customers is at increasing risk.

Market forces and other innovations have not had a significant impact in helping find and implement the best-value solutions for customers. The current approach to water resource planning and overall business planning has delivered significant investment over the last twenty years, but it has done this principally through consideration of conventional options and funding of company-derived 'preferred' solutions. Some new inter-zonal and inter-company transfer schemes have been implemented, but these have typically been relatively small-scale. Large disparities in the marginal cost of water between neighbouring water resource zones and between neighbouring companies have remained. This suggests the current approach has struggled to always identify, promote and support the best use of scarce water resources.

We believe that the current approach to finding a preferred solution and presenting a water resources plan may not provide sufficient encouragement to potential new entrants to the market, partly because of the planning process itself and partly because of the low incentive, high risk nature of trying to provide 'preferred' options within the water resources planning framework. There are innovative options that remain 'untapped', including effluent re-use and trading, catchment management solutions, aquifer storage recovery, dual supply and network optimisation.

The way in which the water sector plans needs to evolve. It needs to provide a better range of information in presenting plans, to encourage innovators to offer options into the decision framework on an ongoing and competitive basis. Plans should provide a better basis for new entrants to understand the opportunities and manage risks through a staged progression of solutions. We believe this improved framework is possible and should encourage more positive and entrepreneurial attention to innovative options and solutions.

The principle of maintaining 'live' alternative options, rather than selecting a single preferred solution, is an important aspect of finding the right solutions, while also facilitating innovation and competition. The approach could develop to accommodate, or even become dominated by, a high degree of competition amongst new entrants, bidding to achieve the successful solution to maintaining the balance of supply and demand.

The reforms we propose should enhance the ability of the sector to deliver the best value water resource solutions in line with the priorities of our customers and the environment.

1. Introduction

The current water resources planning approach has served the industry well over the last 15 years. Since privatisation, water companies have improved the connectivity of the water supply network, reduced leakage, increased metering and water efficiency and have made some significant investments in new resources. Over the last 10 years Southern Water has invested in the development of a new pumped-refill reservoir in north Sussex, built new transfer pipelines between its own water supply zones to move water around the region, established new trading connections to and from other water companies and embarked on a universal metering programme, which is now nearing completion.

However, we continue to face a diverse range of challenges, from continued population growth, climate change and protecting the environment, to rising energy costs, affordability concerns and the need to support wider economic growth. In April 2012, seven water companies across the south east introduced temporary use bans following two consecutive dry winters. This was followed by the wettest summer on record, so water resources recovered, but had this not occurred many predicted that this could have led to one of the most serious droughts ever experienced in the UK. Water supplies could have become seriously restricted. This raised new questions about the resilience of supplies now and for the future and whether the existing planning approach was sufficiently transparent and focused in respect of delivering greater resilience.

For Southern Water, this "near-miss" confirmed a belief that the way in which the sector plans water resources needed to evolve to ensure we develop more resilient and adaptive water supplies for the future, while also reducing our impact on the natural environment and better capturing and responding to customer views. In our engagement with customers for the recent price review (PR14) and our Water Resources Management Plan (WRMP) our customers expressed a clear desire for improved resilience and better environmental outcomes.

Southern Water has already done a great deal of work that proves how important it is to make the right level of information available to customers, regulators and others and for choices to be clearly explained. The complex nature of the future challenges we face mean that more advanced and innovative assessment techniques are now needed to give additional confidence that the best value solutions are identified and implemented. Finding new ways to harness innovative options and market forces will be an important aspect of achieving this. Adaptability and flexibility in the face of uncertainty are central to the further improvements we propose.

This paper describes how Southern Water's approach has developed over the last 10 years to tackle these issues and how it will be enhanced to prepare our next WRMP to ensure a best value, resilient outcome for customers.

It is intended to inform Ofwat's Water2020 programme, which is looking at the water sector of the future, and to contribute to the wider water industry's thinking about the future direction of water resources planning. We would welcome comments on the ideas set out in the paper. Comments should be sent to: Water 2020, Southern Water, Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX or by e-mail to Regcorrespondence@southernwater.co.uk.

2. Limitations of the current approach to water resources planning

2.1 Innovation and market opportunities

The current approach to water resource planning and overall business planning has delivered significant investment over the last 15 years but it has done this principally through conventional approaches to developing new water resources. The exception to this has been a progressively greater emphasis on leakage reduction (through target setting) and, more recently, greater emphasis on metering and water efficiency.

Some new inter-zonal and inter-company schemes have been implemented but these have typically been relatively small and disparities in the marginal cost of new water resources between neighbouring water resource zones and between neighbouring companies have remained and in some cases grown. This suggests the current approach may not have been able to identify, promote and support the best use of scarce water resources.

There are many innovative options that still get limited consideration and investigation within the current planning framework. These include:

- **Trading effluent.** Wastewater re-use schemes do feature in some company plans, but are looked at as a conventional water resource option rather than a market opportunity for third parties (including wastewater companies). There could be greater opportunities for both direct and indirect effluent re-use schemes creating potential opportunities for new entrants in this area.

- **Aquifer Storage Recovery.** Some clean water schemes exist and are considered as options within company WRMPs, but trial costs and timescales remain a barrier to progression within the current five-yearly regulatory cycle. For treated effluent, there are additional regulatory barriers, but these may not always reflect the latest treatment technology and potential management regimes.

- **Leakage technology.** There is scope to develop leakage reduction technology and techniques to move us toward the goal of much lower economic leakage levels. The sector, working through research body UKWIR, has set a ‘zero leakage by 2050’ challenge and has generated new ideas for shifting future leakage levels to much lower levels than currently forecast by companies. These initiatives are dependent on new approaches to research and development, as well as close collaboration with the supply-chain.

- **Developing real-time smart network management systems.** Some companies are actively exploring and investing in real-time systems, but the longer-term potential to fully integrate supply management, distribution system management, pressure management and quality management could remain a theoretical possibility, without changes to the way the sector plans.

- **Dual supply systems for new developments.** Dual supply (separate potable and non-potable) water supply systems remain one of the greatest potential areas for demand reduction but are severely constrained by both regulations and implementation costs. There is an opportunity with new developments of a certain scale and this would lend itself to greater government and regulatory exploration. New ‘garden cities’ could provide a basis for showing what can be done but would require a supportive planning and regulatory framework.

- **Tariff development**. Southern Water's metering programme is almost complete and is expected to achieve 90% metering by the end of 2015. In supporting the metering programme, customers were wary of novel tariff proposals. However, as customers become more accustomed to paying for what they use, alternative tariff arrangements are likely to become more acceptable to customers in the future.

- **Achieving environmental and water quality objectives by catchment management.** Catchment management and in-stream management can address environmental objectives 'at source'. There is increasing realisation that these approaches will be more economic than capital investment to improve water quality. Catchment management can reduce nitrates and other pollutants directly or via sediment pathway management. In-stream schemes to alter structures or channel morphology can improve flow regimes, velocities, in-river habitat and help fish passage and spawning success. Wider eco-system services approaches can build better environmental (habitat and species) resilience. If coupled with flexibility in abstraction and discharge permit conditions, there could be further gains to be made from innovation in this area.

In addition to these limitations, third party providers of water resources have not made any significant advances into the market and show little sign of being able to do so. This may be due to the focus on conventional options and approaches. By not creating space for entry into the market, we risk impeding the scope for genuine innovation.

Some of the constraints on these more innovative solutions are, in part, a function of the regulatory framework. The regulatory bias to capital expenditure rather than operating expenditure has had a significant influence for much of the last twenty years, encouraging companies to invest in conventional water resources capital schemes.

It is also recognised that the abstraction licensing framework has been (and remains) too restrictive. This has led to the (very welcome) Abstraction Reform review and the development of Ofwat's Abstraction Incentive Mechanism (AIM) initiative. These may have a positive impact in the future, but they remain fledgling considerations with uncertain implications at present. It remains highly likely that the overall amount of water under licence for reliable abstraction for consumptive purposes will need to reduce, so reform and/or AIM have a key role to play.

Although the WRMPs are revised every five years, the way they are currently constructed and presented deters third party involvement, because they are led to believe the plan is cast for the next twenty-five years and the 'preferred solution' will always be the implemented solution. Furthermore, the level of information and confidence needed around an option for it to compete within the options appraisal is a significant hurdle to be overcome by any third party. The current process sets too high a bar to encourage speculative and innovative bids from third parties.

2.2 Incorporating resilience into the planning process

The current planning guidelines for the sector require water companies to plan on the basis of a single 'dry year' scenario, expecting the most serious drought from the historic records to be used as the basis of the supply forecast. The guidance encourages the use of up to 100 years of historic data, though in practice less data will be available for many (especially groundwater) sources.

In the last 100 years there are just five significant droughts which are all of relatively similar magnitude. Their similar magnitudes suggest that, in overall terms, they may not be especially severe. Worse droughts will occur in the future, sooner or later, but the current planning approach has discouraged looking ahead to consider the droughts of the future, which may be more severe and last longer than those in the recent historical record. According to current planning guidance we should only plan for drought events that have happened. This limits the resilience of our network to cope with more severe or otherwise different situations.

2.2 Separate plans for water resources and drought management

Water companies currently produce two published plans. The WRMP sets out the schemes and investment required to secure supplies for the next twenty-five years and the Drought Management Plan details the triggers that show when we are moving into drought and the management actions that will be taken as drought progresses. Both plans require public consultation, although their planning cycles have not been aligned to date. Feedback from customers and stakeholders suggests that these plans should be brought together into one plan, which sets out the full picture of water resource management plans and activities.

2.3 Planning for uncertainty

The current planning guidance attempts to accommodate uncertainty through a target "headroom" allowance. Alternative scenarios can be considered as sensitivity tests but the current approach focuses heavily on a single scenario. This can result in the selection of a set of options and an overall solution which, under certain circumstances is the most appropriate, but when those circumstances change, is less favourable. As a result it may fail to take account of real-world uncertainties.

2.4 Wider economic considerations

At present we carry out "willingness to pay" research to help us establish how much customers are prepared to pay for improvements to the services they receive, including how often they will accept hosepipe bans and other restrictions on domestic or commercial use. The current approach doesn't look at what impact different levels of service would have on the wider economy of the area. Some water supply zones will be home to more industry and businesses, more reliant on our services to continue to produce than others, so consideration should be given to what impact a service failure or service reduction would have on their ability to operate and the knock-on effect to the wider economy.

There is also a wider, "UK plc", economic aspect, but this wider impact is not currently accounted for. A recent Defra / Environment Agency project on "Strategic water infrastructure and resilience' has indicated potential costs to the wider economy and society of many tens of billions of pounds from any wide and prolonged restrictions of water supply. Much of this cost is estimated to accrue from the south east of the country.

Other important economic influences on the solutions chosen in the plans are energy and carbon costs. These are included as fixed estimates in the assessment. Sensitivity tests can be applied but the core approach uses a 'best estimate' forecast across the whole planning period. This limits reflection on the risk and uncertainty of these estimates and their influence on the choices in the appraisal.

2.5 Accounting for environmental and social costs

The current water resources planning approach uses the Environment Agency's Benefits Assessment Guidance (BAG) to account for environmental and social costs. This is applied through the options appraisal process. However, the BAG does not provide a good assessment, particularly for schemes with marginal impacts or for groundwater-related schemes and impacts, for which its guide data is sparse. It requires large assumptions in application to more innovative options, if it is applicable at all. It also does not take into consideration the amount of water available within the water resource zone.

The Strategic Environmental Assessment, the other main environmental assessment applied, is focused on the overall plan, once preferred options have been chosen, and is not really suited to addressing the weaknesses of the BAG.

3. Improvements for the future

To overcome the limitations of the current planning approach that we have identified and to ensure that we can meet some of the future challenges we face, we intend to make changes to improve the customer engagement, resilience assessment, options appraisal and decision-taking aspects of forming and implementing our future plans.

These further improvements are 'outcome' focused, aimed at providing greater confidence of delivering the best outcomes for customers and the environment. They include an enhanced framework for options appraisal, along with exploration and presentation of alternative solutions and choices. We believe the approach will also better-accommodate innovative options and solutions in the future, including market opportunities and our plan will be more adaptable to future uncertainties.

3.1 Southern Water's intended improvements

In 2014 we made a significant change to the way we developed our WRMP. Rather than simply using the historic rainfall records, we developed a new approach, based on a stochastically generated rainfall data set, which allowed us to plan for a much wider range of potential drought situations.

We worked with Newcastle University to generate an additional 2,000 years' worth of alternative rainfall patterns, based on the historic records. The University of East Anglia then supported us to model this data against each of our water resource zones to look at how they would perform in different situations. This included a greater range of droughts, including three and four dry winter scenarios, which were more severe than those seen in the historic records.

This method of planning allowed us to look forward and build much greater resilience assessment in at the planning stage to help tackle the uncertainties of the future. Our customers supported this approach, with 85 per cent agreeing that we should plan for more serious droughts. Willingness-to-pay research also showed customer support for additional investment in preparing for these future challenges.

We achieved this fuller appraisal of drought scenarios through the development and application of a stochastic rainfall data set. We believe all companies would benefit from an equivalent approach and there is a potential efficiency to be achieved by the industry if the development of such data set was done nationally.

In line with our customers' preferences for enhanced security of supplies, improved environmental performance and more affordable bills, we intend to further improve our overall approach to preparing the next WRMP, with seven specific improvements planned.

(i) Improvements to the scheme selection process and the ability to present a framework of alternative solutions and choices through the use of 'real options appraisal'. This will also provide more clarity on the opportunity to prepare options on a stage-by-stage basis and the potential to implement innovative solutions on a trial or partial basis before a decision on full implementation.

(ii) Further improvements in how we reflect customer preferences through the application of multi-criteria analysis.

(iii) Integration of the Strategic Environmental Assessment and environmental and social costs information.

(iv) Consideration of the long term environmental costs of current abstractions, through the use of "shadow pricing".

(v) Better reflecting the long term viability of water resource options by considering an extended planning period.

(vi) Fuller consideration of "natural capital" and alternative environmental objectives, via catchment and in-stream option solutions.

(vii) Integration of the Drought Management Plan and WRMP, via assessment across a matrix of drought severity scenarios, exploring both magnitude and duration.

As well as encouraging new entrants by improving the visibility of opportunities to make supplies available, we are also exploring how, and at what stage, we can pro-actively invite third party bids to compete against the preferred plan solutions in a competitive process.

3.2 Improved methodologies and enhanced plan presentation

It should not be necessary for regulators to stipulate particular approaches or detailed methodologies. However, we believe the issues and challenges described above show the need for more advanced and innovative assessment techniques. We believe it is essential that water resources planning and its implementation develop to embrace:

- Wider multi-scenario appraisal and consideration of a longer planning period. This will help ensure the best available solutions are identified. Multi-scenario, multi-parameter assessment and decision-aid techniques should be used (whilst taking care to maintain the transparency essential to a customer-supported outcome).

- More holistic options appraisals, including greater consideration of innovative options, to move beyond the traditional conflicts between environment, affordability and resilience.

.

- The need to keep alternative options 'live' during implementation of the plan. This is an important part of dealing with uncertainties and maintaining the greatest possibility of delivering the best value solution. This could develop such that alternative options continue to "compete" beyond the appraisal undertaken for the plan.

- A perspective on the wider economy and the wider expectations of society, alongside customer and stakeholder views.

There is also a need to recognise that there is unlikely to be a clear 'least cost' solution and there may not be an outright clear 'best value' one. There will be choices between alternative options and alternative solutions and the differences may be subtle, qualitative or subject to uncertainty.

To achieve greater resilience, a better understanding is required of the current resilience of water resources, water supply and wastewater systems, the range of ways to achieve future resilience and the level and type of resilience that should be considered in planning.

3.3 Dealing with uncertainty

We believe a more open and transparent approach to dealing with uncertainties should be encouraged in respect of planning for the future, how plans are presented and the regulatory support and funding of them. Multi-scenario assessment enables consideration of uncertainties in a more transparent way than the current approach of applying a target "headroom" allowance. A multi-scenario appraisal can provide a superior approach to considering risks and uncertainties and so find the solutions that are most suitable across a wider range of conditions. It can also identify implementation approaches most suited to changing information and can provide a better focus for alternative solutions, including market opportunities.

A good plan should identify decision points at which it is expected that choices will have to be taken between options and implementation of the chosen option will commence. Prior to these decision points the plan should set out a number of alternative options that will be kept 'live' - under investigation or progressing through some (stage by stage) degree of preparation, including trial where appropriate. Such trials could be extensive and provide solutions if successful or, if proving unsuccessful, trigger the need to implement another option. The decision points should also provide a focus for actions to reduce uncertainties where possible. This is a key aspect of better planning and achieving long term best value outcomes.

Methods such as 'real options appraisal', which Southern Water is currently trialling, facilitate this form of presentation. In order for the approach to be carried through in practice, a company needs regulatory support for the work involved in keeping options 'live' and for actions to remove uncertainties. The regulatory regime also needs to allow for the fact that a trial or innovative solution may prove unsuccessful and result in need to implement another option. There are costs to all these aspects of the approach, but they are costs that should greatly increase the chance of making the right decisions at the right time, to deliver the outcomes that customers want.

3.4 An integrated approach across water resources and drought planning

Consideration of wider drought severity is a fundamentally important aspect of multi-scenario water resources planning assessment and understanding resilience. We understand the Environment Agency intends to develop the Water Resources Planning Guideline (WRPG) to encourage all companies to provide greater transparency of how the WRMP and Drought Management Plan, in-combination, maintain supplies across a range of droughts.

We also understand the Environment Agency will develop the WRPG to encourage discussion of resilience and the different types of solutions that are possible, ranging from more investment in permanent measures to more reliance on temporary measures during drought, while recognising the investment necessary to prepare those temporary measures so that they do provide the intended solution during drought.

Southern Water have already assessed the sensitivity of our WRMP to a range of drought severities (drought magnitude, including duration) and as a result we have been able to have much better conversations with customers about planned levels of service and give better consideration of resilience to drought.

The Environment Agency's intended approach will also make it more transparent that, as drought severity increases, full supply services may not be maintained and, eventually, emergency measures may be necessary. Importantly, it should expose any issues around the reliability of shared resources and bulk supplies, so that these can be dealt with in planning, rather than running the risk that unexpected reliability issues arise during a drought. This greater transparency should also provide important information to the wider market about the opportunities for third-party supplies and the market for these, as well as overall resilience.

We strongly welcome the Environment Agency's intended developments of the WRPG. This improved approach needs also to be reflected in the way that price controls are set within the periodic review process.

4. Interactions with abstraction reform and other current regulatory initiatives

Much has been done to address unsustainable abstraction, but there remain further substantial implications for future abstraction from the Environment Agency's River Basin Management Plans. Aspects of Abstraction Reform and the Ofwat Abstraction Incentive Mechanism (AIM) also remain under consideration to help achieve sustainable abstraction.

An Abstraction Reform Bill was not included in the Queen's Speech this year, but we expect it will come forward within the next few years. It is not yet clear what reforms will be proposed, but current indications are that the focus is likely to be on amendment of 'paper' licences, rather than establishing full abstraction licence trading. Trading may be limited to 'normal' (non-drought) circumstances and limited locations. We are very open to exploring the opportunities that might arise from a wider trading-orientated system but, having carried out some exploratory work in this area, we do not underestimate the effort that may be required to convince other licence holders of the benefits.

From the assessments we've already made, it is clear that a more holistic approach to the management of abstraction and the management of discharges is important within a licence trading context (but also in its own right). A system of credits for discharges (to quality standards) could be a valuable development – both generally or for specific sites.

Ofwat has also recently re-instigated interest in the AIM, which is designed to incentivise the reduction of abstraction from the most environmentally sensitive sites. While the decision was taken at PR14 to make the AIM a reputational, rather than financial incentive, we believe the approach has significant potential merits. We believe it could be possible to adapt our intended 'shadow pricing' approach to an AIM-type approach and are keen to explore this possibility further.

We would encourage Ofwat, the Environment Agency and Defra to consider carefully how Abstraction Reform and AIM (and shadow pricing) approaches might work in a complementary way. Our view is that the two are not necessarily mutually exclusive – while Abstraction Reform should impact more on normal operations, AIM provides a longer-term planning tool.

5. Improving market opportunities

As we note above, market forces and innovation have not made a significant contribution to maintaining the balance between supply and demand and delivering the optimal level and quality of services for customers. We believe the current approach to finding a preferred solution and presenting a plan may not provide sufficient encouragement to third parties who may wish to enter the market, partly because of the planning process itself and partly because of the low-incentive, high-risk nature of trying to provide 'preferred' options.

We believe the improvements we have proposed to the planning approach and the way plans should be presented provide a more supportive framework to attract innovative proposals by providing far more clarity of decision time lines, and on the potential opportunities for trials and staged or partial implementation of options.

Making this information more easily available within plans, along with the concept of keeping alternative options 'live', will create opportunities for third parties to offer options into the decision framework on an ongoing and competitive basis. It should provide a better basis for third parties to understand the opportunities and manage risks. We believe this improved framework should encourage the bringing forward of more of the innovative options we've highlighted above, providing greater security for our customers now and in the future.

Keeping alternative options ‘live’ and in competition with each other, up until the point of final implementation, should help ensure that the best value solutions are found. If the right incentives are provided to go with this framework of opportunity, we envisage the process could evolve to encompass a significant degree of competitive bidding to prove and provide the implemented solution. Making sure the right incentives are available will be key. The approach and the incentives need to recognise that some options may be progressed as far as trial or partial implementation only to eventually 'lose' to a more preferred competitor option.

6. Conclusions

We have outlined above a number of limitations in the way the sector currently plans to balance supply and demand and a series of suggested improvements to address some of these limitations. To meet the complex challenges we face, water resources planning needs to evolve to ensure that innovative solutions and third party entrants are encouraged. To do this we believe the sector needs to adopt more sophisticated, multi-scenario appraisal approaches to enable the identification of the best value, most resilient solutions and map out decision timelines and choices for better overall decision taking.

Under our proposals, the timing of opportunities will be clearer and the principle of maintaining 'live' alternative options, progressing through stages of preparation, trial or partial implementation, should encourage greater interest from third parties and partnership approaches. We envisage this could develop to accommodate or even become dominated by a high degree of competitive progression of options by market innovators, bidding to achieve the successful solution to maintaining the balance of supply and demand.

Some of the more innovative options available may bring additional risk and longer timescales, compared to conventional approaches, but the overall benefits could be considerable, for both customers and the environment. Greater incentives are needed to drive more activity in these areas, together with a better overall recognition in the regulatory framework of the value of progressing them. To reap the full benefits, many of the options - including catchment management and in-stream options – also require environmental permitting to develop more innovatively.

We firmly believe that the proposals we set out above are not only desirable, but essential to ensure that we are able to go on delivering the safe, secure, resilient water supplies that our customers expect. We will continue to explore further opportunities to deliver more effective water resources planning to ensure that we are making the right decisions at the right time, to deliver the outcomes that customers want.