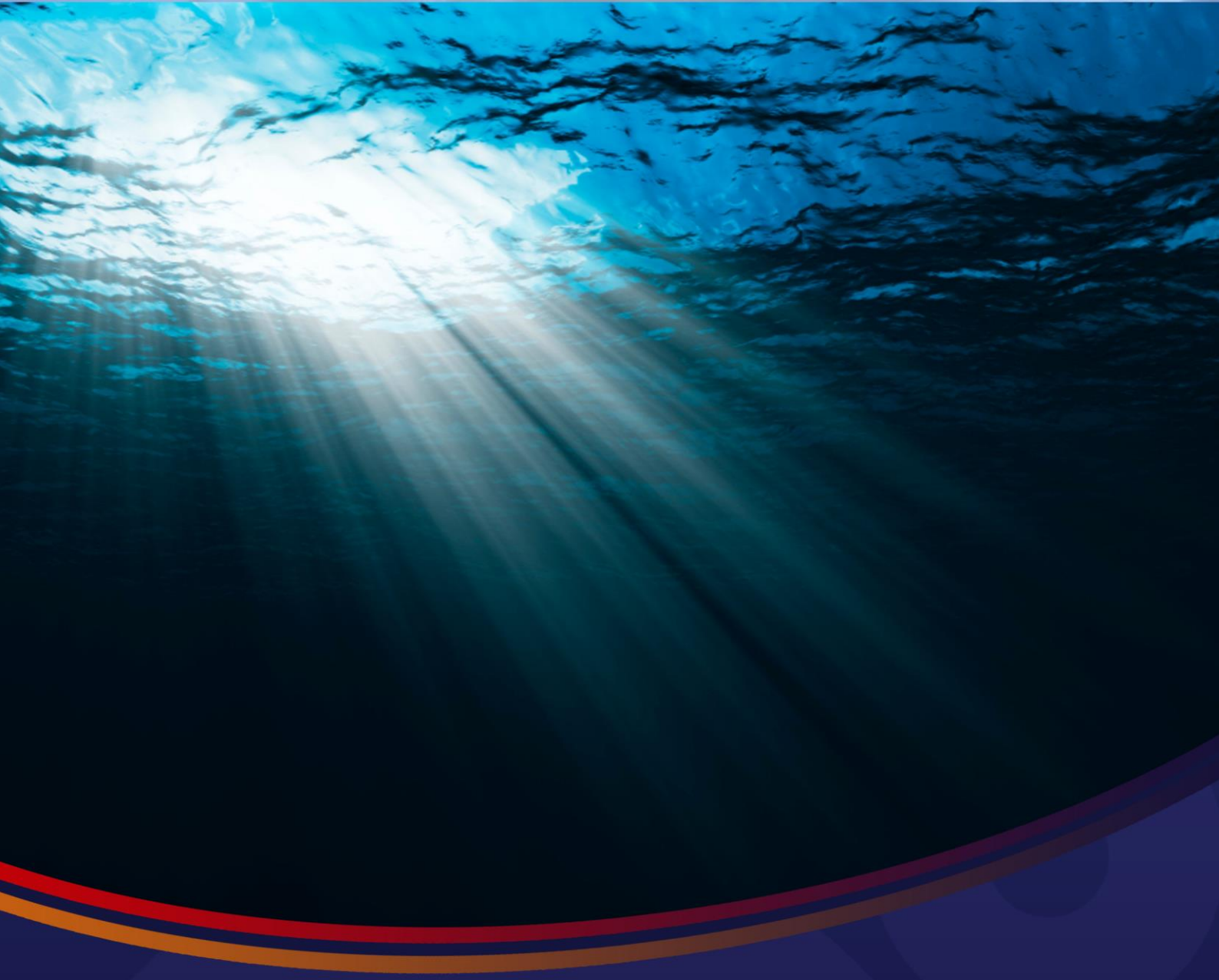
Demand Utilisation Risk in Water Resources

Report for Southern Water

October 2016

Economic Insight

CONTENTS



1. Summary and Introduction

In its May 2016 decision document, Ofwat set out proposals to transfer demand risk in water resources to companies. In doing so, Ofwat distinguished between competition demand risk (to be fully transferred) and market demand risk (to be partially transferred). Accordingly, Southern Water asked us to provide an assessment of the likely impact and implications of these proposals. This report sets out our findings.

In summary, our views are that:

(i) Whilst the transfer of competition related demand risk might be less contentious, **there is no prima facie reason to believe the benefits of transferring market demand risk will outweigh the costs.**

(ii) An assessment of the evidence supports the above. **The transfer of market demand risk could increase the asset beta for water resources by 0.1-0.2,** and give rise to material **unintended consequences** and customer harm.

(iii) **If Ofwat were to transfer market demand risk, this would need to be 'limited'.**

(iv) **Ofwat's desire to ensure water resources investments are as efficient as possible is understandable.** Further consideration of what 'problem' needs to be addressed may help clarify what, if any, policy solutions are needed at PR19.

1.1. Executive Summary

Southern Water (Southern) commissioned Economic Insight to consider the implications of Ofwat's proposal to allocate demand risk to companies in relation to water resources. The primary focus of our work has been in relation to the potential for Ofwat to transfer some of the *'market driven'* element of demand utilisation risk – and, in particular, to develop evidence as to what the impact of this might be.

Accordingly, this report sets out our findings and recommendations, which are as follows:

- The transfer of the *competition* element of demand risk to companies in water resources is less contentious, because competition should not increase systematic risk.
- However, both theory and evidence indicate that the **costs of transferring the market element of demand risk to companies will exceed the benefits.**
  - First, the transfer of market demand risk has the potential for some **significant unintended consequences**, such as stunting investment, skewing investment to 'less efficient' solutions and undermining the sustainability agenda. Importantly, **it is also questionable as to whether Ofwat would be able to keep its commitment to protecting the pre-2020 RCV, were it to transfer demand risk to companies.** Certainly, the question of RCV protection becomes much more challenging – which (as we explain subsequently) Ofwat itself has acknowledged.
  - Second, the transfer of the market element of demand risk will **increase the cost of capital**. Our review of the evidence implies that the asset beta for water resources could increase substantially – between 0.1 and 0.2. This could materially impact customer bills. The overall impact on the cost of capital might be mitigated if: (i) Ofwat were successfully able to shield pre-2020 assets from demand risk (which, as above, appears to be challenging) and (ii) if demand utilisation was assessed on a more 'long-term' basis (i.e. the mechanism did not result in financial penalties based on year-to-year, or even five yearly, variations in utilisation).
  - Third, the characteristics of water resources (a part of the value chain with a need to secure long-term investment, with sunk costs and long asset lives) **limits the scope for incentive benefits**.
- If Ofwat were nonetheless to proceed with a transfer of market demand risk to companies, our evidence points strongly to a need to 'limit' the extent of risk exposure, given the above.
- However, in practice, making any arrangement that limits demand risk work well (and without unintended consequences) is likely to be complex – which arguably reinforces the conclusion that it is not appropriate to transfer any element of market demand risk to companies.
- We also note that there are other existing regulatory solutions that appear better able to meet Ofwat's stated aims. (For example the totex approach was expressly intended to address the 'inefficiency' problems associated with potential capex bias, which might have led companies to favouring 'own-and-build' solutions in water resources.)
- Notwithstanding the above, **we understand Ofwat's motivation to ensure that water resource related investments are as efficient as possible and are delivering the best possible outcomes for customers.** Consequently, whilst at present the evidence is not consistent with transferring (market) demand risk to companies, that does not preclude the possibility that additional policy tools in this area would not be of merit at PR19. However, **we think that further consideration of exactly 'what' the problem is that one is trying to solve is first required.** At a high level, however, if Ofwat's concern relates to some kind of 'fundamental' overstatement of demand by companies over time, logically, solutions rooted in the price control process itself would seem to be more suitable (although we have not considered this in any detail). In any case, evidence to demonstrate the 'problem' and its 'magnitude' (e.g. is there, in fact, material over capacity in water resources?) would also seem to be important.

1.2. Ofwat's proposals for water resources

In December 2015, Ofwat published a consultation document on its future approach to wholesale price controls.[1] The central theme of the regulator's proposals was the greater use of markets which, in relation to water resources, was primarily motivated by a desire to promote trading (which in Ofwat's view is below its optimal level); and an opportunity to

[1] *'Water 2020: Regulatory framework for wholesale markets and the 2019 price review.' Ofwat (December 2015).*

make more efficient use of existing and future resources, with benefits to both customers and the environment.

To achieve its stated aims (for water resources) Ofwat proposed a number of measures, including: the introduction of separate binding price controls; an allocation of the historical RCV; an access pricing framework; greater information sharing; and tools to promote 'direct procurement'.

Following this consultation, in May 2016 Ofwat published a *decision document.*[2] This set out the regulator's preferred policy position across a number of areas. In some cases, it also provided further details of Ofwat's proposals.

1.2.1. Ofwat's proposals to transfer demand risk to companies

In its May 2016 decision document, Ofwat raised an *additional* proposal in relation to water resources. Namely, that demand-related utilisation risk in water resources should be explicitly transferred to companies. In raising this proposal, Ofwat distinguished between demand risk arising from:

- **Bilateral market entry** (i.e. competition). Due to competition 'in the market' for water resources, incumbents' market shares might be either lower or higher than expected – meaning that there is a risk that their future capacity might be under-utilised, or is insufficient to meet demand.
- **Market-wide demand.** The overall level of demand for water resources from customers across the market as a whole is uncertain. Specifically, there is uncertainty regarding factors such as: population growth, household consumption, industrial demand; and uncertainty associated with weather patterns.

In relation to demand utilisation risk associated with **bilateral competition,** Ofwat is proposing that this should be fully transferred to companies: *"the regulatory framework for water resources should not require customers to provide protection to incumbent water companies against the risks from bilateral market entry for post-2020 investment…. [and therefore] incumbent water companies [should] face utilisation risk arising from bilateral market entry."*[3]

With regard to **market driven** demand utilisation risk, Ofwat said that it had identified three options:

1) incumbent water companies could be fully exposed to market-wide utilisation risk in relation to post-2020 water resource capacity;
2) companies could be fully protected by customers (through the price control framework) against market-wide utilisation risk in relation to post-2020 water resource capacity; or
3) incumbent water companies could be exposed to *some* degree of market-wide utilisation risk sharing in relation to post-2020 water resource capacity.

Of these, Ofwat stated that: *"our current preference is for the third option above (some degree of market-wide utilisation risk sharing in relation to post-2020 water resources investment) as this shares risk around demand uncertainty for new capacity between incumbent companies and their customers."*[4]

Ofwat further stated that it does not intend to expose the pre-2020 RCV (i.e. the RCV up to 31 March 2020) to any demand-related utilisation risk.

1.2.2. The form of the water resources control

Ofwat is proposing a form of price control for water resources that is designed to accommodate its stated aims, as outlined above, to:

- transfer bilateral related demand utilisation risk to companies;
- transfer (some element) of market wide demand utilisation risk to companies; whilst
- ensure that the pre-2020 RCV is not exposed to any demand related utilisation risk.

Accordingly, (and as set out in its May 2016 document) Ofwat is proposing that the control for water resources should be in the form of a total revenue control, **with adjustments**. This means that the control will feature a fixed element, alongside a mechanistic within-period adjustment factor that depends on the scale of bilateral market entry.[5]

The **fixed element** will be calculated using the usual building-block approach, and is expected to include:

- A return on the water resources RCV as at 31st March 2020.

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2 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales.' Ofwat (May 2016)*

3 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales Appendix 3 Tackling water scarcity - further evidence and analysis.' Ofwat (May 2016); page 67.*

4 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales Appendix 3 Tackling water scarcity - further evidence and analysis.' Ofwat (May 2016); page 69.*

5 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales', Ofwat (2016) p156*

- Totex and returns for any additional capacity required from 1st April 2020, with totex being the efficient totex that would be needed in the absence of any additions to capacity as at 31st March 2000.

The **adjustment factor** will be formed as the product of two elements:

- a volume differential, measuring the extent to which customer demand met by the incumbent using additional capacity developed from 1st April 2020 is different to that expected at the price control, **due to bilateral market entry**;
- a unit cost measure – of the costs of additional capacity from 1st April 2020 that is funded through the price control, on an annualised unit cost basis.

Ofwat envisages the adjustment factor as being *small* relative to the fixed element. Ofwat has further stated that it believes it is more transparent to include within-period adjustments than to make adjustments at subsequent price reviews.[6]

Ofwat's May document does not explicitly set out 'how' any element of *market demand* related utilisation risk would be transferred to companies within the price control design. However, logically the above approach would indicate that this would be incorporated within any volume adjustment factor used to transfer bilateral related demand utilisation risk. That is to say, when calculating the 'volume differential' above, Ofwat could include differences between actual and expected demand arising both from: (i) bilateral entry; *and* (ii) (some proportion) of wider market demand risk. We highlight that above, Ofwat describes the volume differential as applying on an annualised unit cost basis.

1.2.3. Ofwat's views on risk

In its December 2015 consultation document, Ofwat stated that the setting of separate price controls should not, in and of itself, lead to increases in the cost of capital.[7] With regards to *form* of that water resources price control, Ofwat further stated: *"We do not consider that there will be any change in risk for the water resources control."*[8]

In its May 2016 document, reflecting its proposals to explicitly introduce volume risk for new investments in water resources, Ofwat provided some further views on risk. With regard to **historical** (i.e. pre-2020) investment, Ofwat said: *"our proposed approach to regulation will not create any stranding risk associated with the pre-March 2020 RCV and no change in the beta or the cost of capital for historical investment, even were bilateral market entry to displace existing resources."*[9]

With respect to risk associated with **new** water resource investment, Ofwat has set out the following views.

- With respect to demand risk arising from *bilateral market entry (i.e. competition),* Ofwat has said that it expects the pace of market development to be gradual. Ofwat has further noted that investors could experience both upside and downside risks on their investments through competition, and so this does not necessarily imply a higher cost of capital. It may, however, affect the balance between the preferred levels of debt and equity finance.
- With respect to risks associated with *market-wide demand,* Ofwat has admitted that some aspects of water demand are likely to be correlated with the wider economy; and could, therefore, increase the cost of capital if borne by firms rather than consumers. Specifically, Ofwat stated: *"we note the potential implications for increased risk to incumbent companies and the potential impact on cost of capital from any increase in non-diversifiable risk."*[10] Ofwat has also said, however, that it may (in some cases) still be appropriate for firms to invest while facing market demand risks, because better risk allocation would improve the efficiency of investment and improve the targeting of capital with consumer interest. Put simply, Ofwat has raised the possibility that that the benefits of allocating market driven demand utilisation risk to companies may outweigh the costs of an increased cost of capital.

1.2.4. Other features of regulation

Finally, it is worth noting that the specific proposal to introduce demand risk to water resources is just one element of a range of features, which Ofwat envisages

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6 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales', Ofwat (2016) A3 p18*

7 *'Water 2020: Regulatory framework for wholesale markets and the 2019 price review.' Ofwat (December 2015); page 133.*

8 *'Water 2020: Regulatory framework for wholesale markets and the 2019 price review.' Ofwat (December 2015); page 134.*

9 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales.' Ofwat (2016); A3 pp 172-173*

10 *'Water 2020: our regulatory approach for water and wastewater services in England and Wales.' Ofwat (2016) A3 page 69*

will collectively support market development. We briefly summarise these below:

- Incumbent operators will be required to make available on their websites **data on supply, demand and costs,** presented in a consistent framework. This is to reduce search costs and information barriers for those identifying new opportunities.
- Incumbent companies will have to set out their policies and processes for **assessing bids from third parties** in a published bid assessment framework. This is to address and lack of transparency in the WRMP management process.
- The development of an **access pricing framework** to facilitate third party entry. Incumbents will publish cost-based charges for network plus services that third parties may need, and the incumbent will need to offer third parties a compensation payment reflecting the extent to which the incumbent's incremental cost of new water resources exceeds its average cost.
- **RCV allocation** to enable the separate water resources price control, the historical RCV will need to be allocated. This is to be done on an unfocused basis, but with each company proposing its own allocation to the water resources control, for Ofwat to review. This was on the grounds that the scale of the privatisation discount meant that RCV allocation on an economic value basis could lead to the whole RCV being allocated to water resources for some companies.

1.3. Key issues

The possible introduction of demand risk in water resources raises a number of important issues, which we address in the rest of this report. Firstly, it raises evidential questions around the potential *impact* of any such transfer, which we address in Chapter 2:

- How does **demand risk affect systematic risk?**
- **How should regulators decide** on the allocation of demand risk?
- **What evidence is there** on the size of the impact of demand risk on systematic risk?
- What is the potential for the transfer of demand risk to result in **unintended consequences, with 'sub optimal' outcomes?**
- What are the **potential benefits** arising from stronger incentive power?

Secondly, it raises questions about what this might imply for the *appropriate regulatory approach,* which we address in Chapter 3:

- **What are the implications of our assessment** of the impact of transferring demand risk to companies?
- **Are there any existing alternatives** to transferring demand that would achieve Ofwat's objectives for water resources?
- How should a **demand transfer mechanism work in practice?**

2. Analysis of Demand Utilisation Risk

This section sets out a range of evidence relating to the potential impact of any transfer of demand risk (in water resources) to water companies on the systematic risk faced by their investors – and also considers the potential implications for firms' investment decisions.

Our review of the evidence suggests the following:

(i) Demand risk arising from (bilateral) competition should not materially impact systematic risk.

(ii) Whether, and to what extent, market demand risk should be allocated to companies turns on balancing any incentive benefits of doing so against the **increase in the cost of capital.**

(iii) Transferring **market demand risk to companies could increase the water resources asset beta by 0.1-0.2,** although this is subject to uncertainty.

(iv) It will also have **unintended consequences that will harm customers and the environment,** including potentially **undermining Ofwat's ability to protect the pre-2020 RCV.** Therefore, the costs of transferring market demand risk to companies are likely to outweigh the benefits.

Following from the previous section, here we set out a range of evidence and analysis regarding the potential impact of transferring demand risk (relating to water resources) to companies. This is structured around the following questions.

- How does **demand risk affect systematic risk?**
- **How should regulators decide** on the allocation of demand risk?
- **What evidence is there** on the size of the impact of demand risk on systematic risk?
- What is the potential for the transfer of demand risk to result in **unintended consequences, with 'sub optimal' outcomes?**
- What are the **potential benefits** arising from stronger incentive power?

2.1. How does demand risk affect systematic risk?

At the heart of whether it might be appropriate to transfer demand risk for water resources to companies is the question of how this might impact *systematic risk.* This matters because any increase in systematic risk would increase the cost of capital – which (all else equal) would lead to higher bills for customers. This issue is set out more fully in Appendix A to this report, but in summary the key points are as follows:

- That *competition* related demand risk might typically be considered to be diversifiable from the perspective of investors. Consequently, exposure to this is unlikely to have a material effect on systematic risk and, therefore, the cost of capital. Following from this, **Ofwat's proposal to transfer demand risk relating to bilateral competition to companies should be less contentious.**
- When considering *market* demand risk, however, it is clear that some of the factors affecting demand would be correlated with the wider economy (for example, weather patterns) and would not, therefore, be diversifiable for investors. Accordingly, the transfer of market demand risk to companies will increase systematic risk and, thus, the cost of capital. Given this, **Ofwat's proposal to transfer some element of market demand risk to companies is more questionable -** and is, therefore, the focus of our paper.

The question of whether, and to what extent, to transfer demand risk to companies turns on a cost-benefit analysis.

2.2. How should regulators decide on the allocation of demand risk?

Whilst the duties of regulators are typically laid down in statute, they retain a degree of discretion as to how these should be interpreted at a more detailed level. Of most relevance to the current issue, regulators may implement different *forms* of price control, where the various options might imply materially different allocations of demand risk between companies and customers. For example, under a 'rate of return' model, *firms would not typically face demand risk;* whereas, under a price or average revenue control, *firms would face demand risk.*

Given that regulators (as is presently the case with Ofwat in relation to water resources) have discretion as to whether and how to allocate demand risk to firms, the obvious question that arises is: *'how should they determine whether this is appropriate or not?'*

A starting point for considering this question is that, in competitive markets, firms do generally bear demand risk. Importantly, in such markets the presence of this demand risk also provides firms with incentives (to operate efficiently, to make appropriate investment decisions, and so on).

From a regulator's perspective, therefore, the question turns on a cost-benefit analysis. That is to say, setting aside competition-related demand risk (which, as we have explained, is less controversial) a regulator needs to balance:

- any increase in the cost of capital associated with the transfer of any *market* demand risk that is systematic; against
- the potential benefits arising from increased incentive power.

Related to the above, it is important to highlight the fact that, in addition to any cost of capital increase, **the transfer of market demand risk to firms may give rise to certain other 'costs', primarily linked to unintended consequences.**

These arise because, in regulated industries, the incentives firms will face, following the transfer of demand risk, are primarily a function of the *design* of the regulatory control. Consequently, it is possible that regulators may either design the control (and related demand risk mechanisms), or set parameters within that control, in a way that gives rise to sub-optimal outcomes. For example:

- If the regulator does not set the WACC sufficiently high to compensate for the additional systematic risk, firms may 'under-invest' relative to the optimal level (thereby undermining the potential capital cost efficiency incentive – and causing customer harm in the long run).
- Similarly, the precise 'way' in which the demand risk transfer is implemented could also give rise to perverse incentives; for example, biasing firms towards shorter-term investment solutions relative to the optimal level.
- The design of any demand risk transfer could 'cut across' wider regulatory and policy objectives associated with social welfare (such as environmental concerns).

Our summary of the potentially relevant costs and benefits is presented in the following table.

Table 1: Types of costs and benefits of imposing demand risk on regulated firms

	Nature	Tend to be higher when
Potential costs	Higher WACC	Correlation of demand with the wider economy
	Unintended consequences: sub-optimal outcomes arising from regulatory design	The regulator is unable to compensate firms with a higher WACC. The regulatory mechanism to transfer risk is misaligned.
Potential benefits	Operating or capital cost efficiencies	Firms lack other incentives to minimise costs A material proportion of costs are controllable Consumers have some meaningful supplier choice Regulators lack information or ability to design alternative incentive mechanism
	Better targeted outputs	Firms lack other incentives to produce outputs consumers most value Consumers have some meaningful supplier choice Regulators lack information or ability to design alternative incentive mechanism

Source: Economic Insight

It is also helpful to draw the above framework together – and consider the question of where and when one might use more or less 'high powered' regulatory approaches in a broader sense.

In this regard, it is generally accepted that:

- regulatory control designs with **lower incentive power** (i.e. less risk transfer to companies) are **more appropriate where it is important to provide strong incentives for investment**; whereas
- regulatory control designs with **higher incentive power** (i.e. more risk transfer to companies) are more appropriate **where investment incentives are less important** – but rather, one might be more concerned with cost minimisation – particularly within price control periods.

For example, Decker (2009) writes: *"There is a clear difference across the approaches in the incentives they present for infrastructure investment. As is well recognised, traditional rate of return regulation* [i.e. where volume risk is borne by customers] *can potentially provide strong incentives for prudently incurred investments… On the other hand, pure price cap regulation* [i.e. where volume risk is fully

transferred to companies] *and LRIC-type approaches can provide more limited incentives for infrastructure investment in settings where substantial uncertainty exists as to whether the costs associated with such investments can be recovered."*[11] This same overarching point is also discussed by Baldwin et al (2013)[12] – and is generally considered to be non-controversial.

The following section considers the relevant evidence relating to our framework in more detail. However, it is nonetheless helpful to consider the above, simple, point in the context of water resources. Specifically, it is well known that the water resources part of the value chain is characterised by the need to make long-term, sunk, capital investments.

As a consequence of this, one would naturally be concerned about any regulatory design that was 'too' high powered. Of course, it is important to recognise that incentive power is a matter of degree. Nonetheless, first principles suggest that:

- the full transfer of the market driven element of demand utilisation risk to companies **is unlikely to be appropriate;** and
- even any transfer of the market driven element of demand utilisation risk to companies **would require careful consideration.**

2.2.1. The relevance of level playing field concerns

Finally, it is helpful to briefly address how the above discussion relates to any potential future development of bilateral competition for water resources. Here, the important points to note are that:

- To the extent that one considered such competition to be desirable or likely, the regulator might naturally wish to ensure that incumbents face the same demand risk as entrants *associated from gains and losses in market share.* Consequently, the desire to ensure a 'level playing field' might further point to the *competition* element of demand risk being born by companies.
- Assuming that entrants into water resources are not themselves price controlled in some form, they would also face *market* related demand risk. However, here the level playing field concern appears less relevant – because, **by the same token, by not being price controlled, entrants would face greater potential upside than incumbents.** Put simply, entrants might face a *different* risk/reward profile; but this would not, in of itself, appear to be barrier to competition. This would only not be the case if the upside available to entrants was insufficient to compensate them for the risks they face. However, if one believed that, it would raise serious questions about the fundamental suitability of water resources for bilateral competition in the first place.

> *"First principles suggest that the full transfer of the market driven element of demand utilisation risk to companies is unlikely to be appropriate."*

[11] *'Characteristic of alternative price control frameworks: a report prepared for Ofgem.' Chris Decker, Research Fellow at The University of Oxford, (2009); page 16.*

[12] *'Understanding Regulation: Theory, Strategy, and Practice.' Robert Baldwin, Martin Cave, Martin Lodge (2013); pp 477-480.*

2.3. What evidence is there on the size of the impact of demand risk on systematic risk?

Having previously outlined the relevant framework for considering the impact of transferring demand risk to companies, here we consider a range of evidence as to what its 'practical' impact might be in relation to water resources. Consistent with our earlier discussion, here we are primarily focused on the transfer of *market* related demand utilisation risk. We have examined evidence from three main sources:

- academic literature;
- regulatory precedent, which allows us to examine actual WACC parameters set both with, and without demand risk; and
- our own *indicative* analysis, based on data provided by Southern Water, which examines the extent to which changes in water demand are systematic (this is primarily to *illustrate* how such analysis could be developed in more detail).

At a high level (and aside from direct empirical evidence) there are two possible approaches to inferring the effect of demand risk on the cost of capital. One can *compare firms that face different forms of regulatory controls*; for instance, firms that are subject to price cap regulation and firms that are subject to total revenue controls – and so on. This is complicated by the fact that, even if one compares firms in the same type of industry, differences in firms' betas may be due to factors other than the extent of demand risk allowed in the control (such as other differences in the detail of regulatory regimes).

Alternatively, one can *examine firms that have experienced changes in their regulatory regime* that involve changes to the amount of demand risk that they face. This is complicated by the fact that other factors relevant to risk may also change over time. Furthermore, the time periods over which regulators implement such changes are often long, meaning that it can be difficult to disentangle the effect of the change in regime.

With these two broad approaches in mind, in the following we set out a range of relevant evidence.

2.3.1. Evidence from literature

Grout & Zalewska (1995) noted the complications described above, and used *news* about changes to regulatory structure to infer the effect on risk. Specifically, during the 1990s, the UK government proposed changing the form of regulation of all regulated utilities in the UK *from a price cap to a profit sharing mechanism.* After 25 months, this plan was abandoned. While it was seriously expected to be implemented, however, firms' *future* revenue streams would have been perceived to have lower systematic (specifically demand-related) risk.

The authors therefore used market data to understand how betas for listed UK utilities changed while the proposal was under consideration. There was no change in market risk for equivalent US firms, and the changes in equity beta could not be attributed to changes in leverage. Their overall estimates of the reduction in firms' *equity betas* as a result of removing demand risk range from 0.2 to 0.4. The authors did not give asset beta figures, although they showed that (over the period) leverage was increasing, so could not have resulted in lower equity betas. With leverage ranging from 10% to 40% for regulated firms across the period, this implies that the reduction in asset betas would have been in the range of 0.12 to 0.36.

Alexander et al (1996) examined market data on privately-owned utilities in the UK, US, Canada, Japan, Argentine, Chile, Germany, Spain, Sweden, Australia and New Zealand. They distinguished between regulatory regimes with 'high-powered incentives' **where firms face significant demand risk** and regulatory regimes with 'lower-powered incentives' **where firms do not typically face demand risk,** such as rate-of-return regulation. They then compared betas for these different types of regulatory approach across regulated firms *in the same industry,* and across all types of firm (see table below).

For water companies, this suggests an increase in asset beta of 0.17 due to the introduction of some demand risk, and a further 0.21 from full exposure to demand risk (i.e. 0.38 in total). For regulated firms overall, the equivalent figures are increases of 0.28 on introducing *some* volume risk, and a further 0.11 for exposure to *full* volume risk (i.e. 0.39 in total).

Table 2: Alexander et al evidence on utility betas and exposure to demand risk

Incentives	Electricity	Gas	Energy	Water	Telecoms	Overall
High-powered	0.57	0.84	-	0.67	0.77	0.71
Intermediate	0.41	0.57	0.64	0.46	0.70	0.60
Low-powered	0.35	0.20	0.25	0.29	0.47	0.32

Source: 'Regulatory Structure and Risk and Infrastructure Firms: An International Comparison.' I. Alexander, C. Mayer & H. Weeds (1996); World Bank Policy Research Working Paper 1698

2.3.2. Regulatory precedent

2.3.2.1. Revenue correction mechanism at PR09

One source of regulatory precedent comes from Ofwat's introduction of the revenue correction mechanism at PR09. This removed revenue risk associated with household demand. In addition to correcting for differences between actual revenue collected, and what was assumed at PR09, Ofwat said that the purpose of introducing the revenue correction mechanism was to provide companies with a financial incentive to encourage their customers to use water efficiently.[13]

Ofwat explicitly noted the effect of the introduction of the revenue correction mechanism in its final determination.

> *'The revenue correction mechanism … removes any risk associated with household demand, limiting any difference in systematic risk to demand from large users."*[14]

In its *'balance of risk'* paper for Ofwat at PR14,[15] PwC suggested that one could examine the change in asset beta between PR04 and PR09 to understand how the removal of demand risk might have affected water companies' asset beta. Between PR09 and PR04 Ofwat's determined asset beta fell by 0.05 from 0.45 to 0.40. However, we note that the PR09 determination took place during the financial crisis, and Ofwat's choices for its cost of equity parameters were deliberately high.

> *"Our final determination cost of equity is at the high end of the Europe Economics pre-marked-up range (3.5% to 7.2%), but we believe that it is necessary to allow the industry to maintain access to finance in difficult economic times. This takes into account general expectations that current economic conditions will continue in the early part of 2010-15 and the need to ensure the cost of equity is sufficient to both keep equity in the sector and attract new equity."*[16]

As a result, comparison between PR04 and PR09 is likely to substantially understate the change in systematic risk that took place as a result of the revenue correction mechanism's introduction. Nonetheless, we note that Ofwat's determined asset beta fell further in PR14, to 0.3. This means that, in total, since this demand risk was removed, the asset beta has fallen by 0.15.

2.3.2.2. CAA NATS En Route determination

Air traffic control presents a further useful piece of regulatory evidence. Whereas airports are either not subject to price regulation, or are subject to price caps (and so are exposed to *full* volume risk), National Air Traffic Control Services (NATS), is only *partly* exposed to volume risk, being regulated through a total revenue cap, plus an adjustment factor. We note that **this approach is very similar to the structure that Ofwat proposes to apply to water resources.** Specifically, NATS En Route plc (NERL) was previously exposed to 50% of any deviations between actual and forecast volume, but the present arrangements are more complex. It has been estimated that NERL now bears somewhat more demand risk, ranging between 63-80%, with a central estimate of 70%.[17]

The CAA settled on an asset beta of 0.5 for NERL (an equity beta of 1.11 at 60% gearing with a 0.1 debt beta). This was on the basis of PwC's analysis of the asset betas of regulated utilities, which are not subject to demand risk, and airports, which are. The estimate for NERL was the weighted sum of the betas for utilities (0.35) and airports (0.55-0.59), with 70% weight put on the airports estimate in accordance with their estimate of the proportion of volume risk that NERL bore. This suggested an asset beta range for NERL of 0.49-0.52.

Table 3: Asset betas used

	Exposure to demand risk	Asset beta
Utilities	None	0.35
NERL	Partial (70%)	0.49—0.52
Airports	Full	0.55—0.59

Source: Taken from PwC analysis

Comparing the betas for NATS, utilities and airports suggests an increase in beta of 0.14-0.17 on the introduction of a substantial portion (70%) of demand risk through a risk-sharing mechanism; and a further increase of 0.06-0.07 on the assignment of full demand risk to the firm. This is shown in the following figure.

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13 *'Final price control determination notice: policy chapter A4 – reconciling 2010-15 performance'. Ofwat (2014); page 5.*

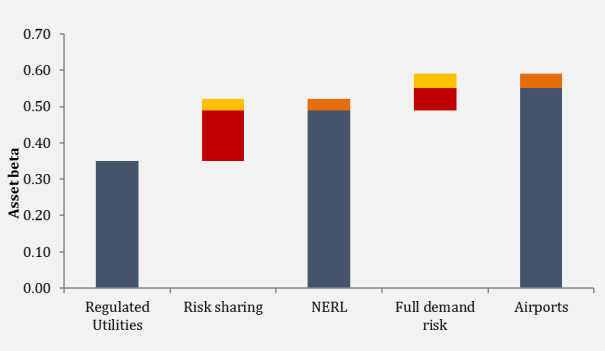
14 *'Future water and sewerage charges 2010-15: Final determinations.' Ofwat (2009); page 133.*

15 *'Balance of risk: Risk and reward across the water and sewerage value chain.' PwC (2015); page 69.*

16 *'Future water and sewerage charges 2010-15: Final determinations.' Ofwat (2009); page 128.*

17 *Estimating the cost of capital for NERL: A report prepared for the Civil Aviation Authority.' PwC (2014); page 42.*

Figure 1: Differences in asset betas attributed to differences in demand risks



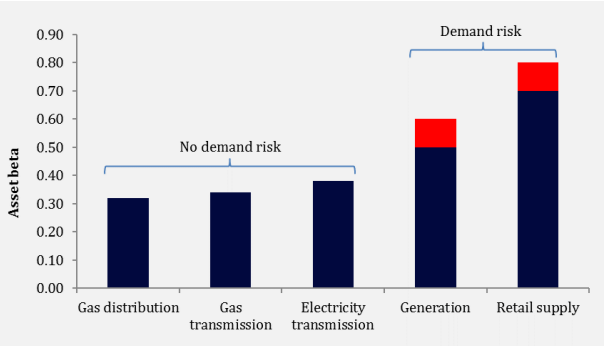
Source: Economic Insight analysis of PwC report

2.3.2.3. Competition and Markets Authority and Ofgem on energy

Relatedly, we can compare regulators' determinations of betas *across* the energy supply chain. Electricity generation and retail supply are not subject to price controls, but do have material demand risk. The situation with electricity generation has obvious parallels with the situation that Ofwat envisages for water resources.

As part of its energy market investigation, the CMA estimated asset betas for energy generation of 0.50 to 0.60; and for the retail supply of energy at 0.70 to 0.80. These compare with asset betas of 0.32 to 0.38 in Ofgem's most recent determinations for electricity and gas transmission and distribution.

Figure 2: Differences in betas among parts of energy supply chain



Source: Economic Insight analysis of regulatory determinations

Taking the most conservative comparison, between energy generation and electricity transmission, suggests a difference in asset beta of between 0.12 and 0.22.

2.3.2.4. Northern Ireland Utility Regulator on Phoenix Natural Gas

In 2007, **the regulation of Phoenix Natural Gas was changed from a price control to a revenue control; and its allowed rate of return was reduced from 8.5 to 7.5 per cent.** The determination did not, however, set out explicit cost of capital components. Further, at the same review a mechanism was introduced that would have *reduced* its risks relating to both opex and capex.[18] It is not, therefore, possible to infer how the removal of demand risk alone affected its asset beta, except to say that it reduced the allowed cost of capital by **more than one basis point** (i.e. given there were other offsetting risk-reducing mechanisms put in place).

2.3.2.5. Cross-industry comparisons

Wider regulatory precedent can also be used to consider how differences in demand risk might affect systematic risk, by comparing controls in which companies are exposed to demand risk with controls in which they are not. The most recent determinations from UK sectoral regulators are shown in the following table (see overleaf), alongside the form of control to which they are subject.

[18] *'Phoenix Natural Gas Limited Price Control Review 2012-2013: Final Decisions.' Northern Ireland Utility Regulator (2012); page 61.*

Table 4: Asset beta determinations across UK regulated industries

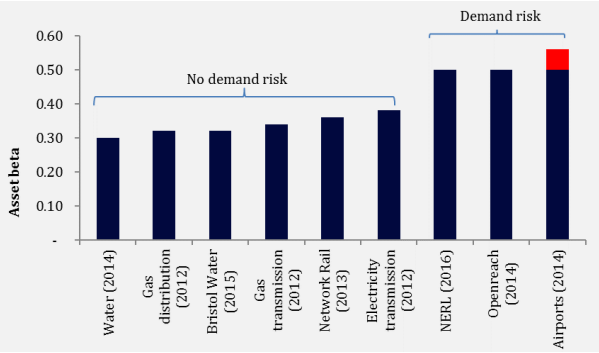
Determination	Regulator	Form of control	Asset beta
Electricity transmission (2012)	Ofgem	Revenue cap	0.38
Gas transmission (2012)	Ofgem	Revenue cap	0.34
Gas distribution (2012)	Ofgem	Revenue cap	0.32
Bristol Water (2015)	CMA	Revenue cap	0.32
Water (2014)	Ofwat	Revenue cap	0.3
Network Rail (2013)	ORR	Hybrid revenue/price cap with no volume risk	0.36
NERL (2016)	CAA	Revenue cap with volume adjustment	0.5
Airports (2014)	CAA	Price cap	0.50-0.56
Openreach (2014)	Ofcom	Price cap	0.5

Source: Economic Insight analysis of regulatory determinations

Comparing these determinations suggests the following broad conclusions:

- Industries with revenue caps, that are not subject to demand risk, tend to have asset betas that are in the range 0.30—0.40.
- In contrast industries that are subject to demand risk tend to have asset betas in excess of 0.50.
- **This suggests that demand risk leads to increases in asset beta in the range of 0.10 and 0.20.**

Figure 3: Asset beta determinations across UK regulated industries



Source: Economic Insight analysis of regulatory determinations

2.3.2.7. Conclusions

The overwhelming weight of both literature and regulatory precedent indicates that the transfer of demand risk to companies increases systematic risk. The range of potential effects is wide, and obviously depends on the particular circumstances of the industry in question. **These examples suggest an increase in asset beta of at least 0.05, and potentially in excess of 0.3.**

Of the examples set out here, we place weight on the examples from air travel and energy, which come from comparisons of different parts of the same value chain. This is because these examples avoid (to a degree) some of the complication of not being able to control for other important drivers of systematic risk. Similarly, the evidence from Alexander et al in relation to water is clearly also relevant. This suggests an increase in asset beta of 0.17 on the introduction of *an element* of demand risk.

The NATS example suggests that the introduction of partial but material exposure to demand risk, in the region of 70%, would increase asset beta by between 0.14 and 0.17, while the evidence from energy suggests an increase of between 0.12 and 0.28. Overall, our view is that **the evidence is most consistent with an increase in asset beta in the region of 0.10-0.20.**

Clearly, it would be preferable if one could directly observe actual changes to a water company's beta *in response demand risk specifically relating to water resources being allocated to that company.* However, as far as we are aware, no regulator has yet implemented a model where this has occurred. Therefore, none of the precedent or academic literature perfectly addresses the question at hand here.

As a result of the above, there is clearly subjectivity associated with 'what weight' one attaches the evidence and studies that do exist. Therefore, one might reasonably review the same evidence set out here and reach a different interpretation as to the implications for the asset beta for water resources, should market demand risk be transferred. We have, however, sought to weigh the evidence fairly, and have been transparent about the judgements we have applied.

Table 5: Summary of evidence on differences in demand risk and asset beta

Source	Industry	Difference in demand risk	Change in asset beta
Ofwat	Water	Reduction in demand risk from revenue correction mechanism	0.05—0.15
PwC advice to CAA	Air travel	Difference between airports and air navigation services beta estimates	0.06—0.07
PwC advice to CAA	Air travel	Difference between air navigation services and utilities beta estimates	0.14—0.17
Ofgem & Competition and Markets Authority	Energy	Difference between energy generation	0.12—0.28
Grout & Zalewska	Energy	Possible introduction of profit sharing mechanism	0.12—0.36
Alexander et al	Water	Introduction of *some* demand risk	0.17
Alexander et al	Water	Introduction of *full* exposure to demand risk	0.21
Alexander et al	Regulated industries	Introduction of *some* demand risk	0.28
Alexander et al	Regulated industries	Introduction of *full* exposure to demand risk	0.11

Source: Economic Insight analysis

2.3.4. Calculation using water demand data

As a final piece of evidence, we calculated the effect of introducing demand risk into water resources, using consumption data from Southern Water. As we explain, this is based on limited data, and so should be regarded as *indicative* – and as a start point for developing further, more detailed, analysis.

2.3.4.1. Estimate

As explained more fully in Appendix A, the change in systematic risk that occurs as a result of introducing demand related revenue risk is:

$$\Delta\beta^A = \frac{R}{A}\beta^R$$

where R is the present value of the firms' revenues; and A is the present value of the firm's cash flows (i.e. the value of the asset).

If prices are fixed, then (by definition) they do not affect the percentage change in revenues. This means that:

$$\Delta\beta^A = \frac{R}{A} \cdot \frac{\sigma(\%\Delta q, r_M)}{\sigma^2(r_M)}$$

We note that this is a simplification, as there may still be systematic revenue risk associated with regulators' decision-making (for instance, the risk that in the face of a macroeconomic shock - or that regulators would respond to pressure to reduce bills). Nevertheless, as we are interested in the change in beta as a result of introducing volume risk, and since the other determinants would also be constant, this simplification should not make a material difference to our conclusions.

We can estimate the term $\frac{\sigma(\%\Delta q, r_M)}{\sigma^2(r_M)}$ by regressing changes in water demand on market returns, using total return data from the FTSE 100.

From a firm's perspective, as its bills are calculated on a yearly basis, the relevant difference is changes in year-on-year demand. We therefore also calculated returns on a year-on-year basis. Accordingly, the following figure shows annual changes in water consumption for Southern.

Figure 4: Year-on-year changes in water consumption for Southern Water, 2005-2016

Source: Southern Water

The term R/A represents the ratio of the present value of revenues to the value of the asset as a whole. Since A = R – FC – VC (where *FC* and *VC* refer to fixed and variable costs respectively) it follows that R > A. To approximate this, we looked at evidence on the ratio of revenues to profits for water companies across time (see table below).

Table 6: Revenues and profits for Southern Water

	Revenue (£m)	Profit after tax (£m)	Ratio
2015/16	£803.7	£119.9	6.70
2014/15	£826.2	£93.60	8.83
2013/14	£806.2	£169.80	4.75
2012/13	£778.7	£156.90	4.96
2011/12	£716.2	£79.90	8.96

Source: Economic Insight analysis of Southern Water annual reports

Overall, this suggests that the present value of future revenues is likely to be up to 9 times that of asset values. Combining this with our estimates of the covariance of demand and market returns, and the variance of market returns, this suggests an uplift in asset beta 0.12.

Whilst the above analysis is only indicative, and should encourage more detailed quantitative work, we note that our estimate of 0.12 is consistent with the wider evidence base previously summarised here (i.e. which implies a range for the beta uplift arising from demand risk of 0.1 to 0.2).

Should Ofwat wish to develop its proposals regarding the transfer of demand risk, we would recommend building on the above approach. In particular, Ofwat could develop more detailed analysis, using this framework, for each firm in the industry – and over as long as time frame as possible. This would potentially provide a more robust estimate of the extent to which

demand-side risk is systematic – and of the implied impact on the cost of capital.

2.3.4.2. Overview of evidence reviewed

Based on the range of evidence reviewed here (i.e. the **literature, precedent** and our **analysis** of Southern Water data) we find that the overall impact on the asset beta associated with the transfer of (the market element of) demand risk in water resources is likely to be between 0.1 and 0.2, as summarised below.

Table 7: Summary of implied asset beta uplift from demand risk transfer – overview across evidence reviewed

	Implied asset beta uplift (our assessment)
Literature	0.17
Regulatory precedent	0.10—0.20
Analysis of Southern demand data *(indicative only)*	0.12
Overall assessment	0.10—0.20

Source: Economic Insight

2.3.4.3. Overall effect on the WACC

To see the implications of a 0.1 to 0.2 increase in asset beta for the cost of capital, recall that asset beta is, by definition:

$$\beta_A = g \cdot \beta_D + (1 - g) \cdot \beta_E$$

At the PR14 price review Ofwat set the cost of capital using a debt beta of zero and notional gearing of 62.5%. At this level of gearing, increases in asset beta of 0.1 to 0.2 would increase equity beta by between 0.27 and 0.53. On the basis of Ofwat's other parameters from the PR14 wholesale WACC, this would increase the cost of equity by 1.47% to 2.93%, and the Vanilla WACC by 0.55% to 1.10%.

Of course, **as water resources only represents a proportion of the value chain, the impact on the overall company WACC would be lower than this**. The precise impact will ultimately depend on 'how much' value is allocated to water resources relative to other elements of the value chain.

Table 8: Illustrative WACC impact

	PR14 WACC	Implied water resources WACC
Vanilla WACC (%)	3.6%	4.15—4.70%

Source: Economic Insight

In addition, all of the evidence set out here refers to the impact on systematic risk of water resource assets *that are exposed to demand risk.* **Clearly, any increase in the WACC would not apply to water resource assets that are not exposed to this demand risk.**

Relatedly, a key policy position of Ofwat is to protect the pre-2020 RCV – and specifically, therefore, Ofwat is only proposing to expose 'post 2020' water resource investments to demand risk. Were Ofwat to implement a policy consistent with this, therefore, the *overall* impact on the WACC would again be lower than indicated above, reflecting the 'mix' between pre and post 2020 water resource assets in the industry. However, as we explain in our discussion of unintended consequences (below) it remains unclear as to whether it will be possible to both transfer demand risk for water resources to companies, whilst also meeting the commitment to protect the pre-2020 RCV.

2.4. What is the potential for unintended consequences, with sub-optimal outcomes?

In addition to the potential increase in the cost of capital, the transfer of demand utilisation risk to companies has the potential to create 'unintended consequences'. These, ultimately, could result in harm to customers, investors and the environment over the long term. In this section, we therefore assess a range of these potential unintended consequence in relation to water resources.

2.4.1. The potential to 'stunt' investment

In addition to the impact on the cost of capital, it is critical to think through the potential implications of transferring demand risk in water resources for the investment decisions that firms take.

Firstly, one should start from the simple proposition that firms will only invest in the first place if the payoff from investing exceeds the opportunity cost. Whilst there is uncertainty over the magnitude of any impact, it seems clear (based on the evidence set out previously) that the transfer of *market related*

demand utilisation risk will increase the cost of capital. Following from this, so long as Ofwat sufficiently 'uplifts' the cost of capital for water resources, there should not be any adverse impact on firms' incentives to invest.

In practice, however, the effects could be more complicated. Even if it is possible to calculate the uplift required to maintain investment in the face of an increase in market driven demand risk, it may be that the implied increase is sufficiently large that the regulator is disinclined to allow it (say, due to other objectives, such as the desire to keep customer bills low in the near term). Alternatively, it may be that the data on which Ofwat relies in order to set the cost of capital takes a long time to 'reveal' the impact of demand risk – or indeed, that the impact of demand risk is obscured by other factors.

The evidence in the previous section of this report indicates that the appropriate beta uplift associated with the full transfer of demand risk could be material. Given this, it is reasonable to be concerned that Ofwat might find it difficult to commit to providing this level of compensation, given the certain nature of the impact on customer bills (and the less certain nature of any benefits of transferring demand risk).

There are, of course, some potential options that might mitigate the above concerns. For example, a 'split cost of capital' that differentiated between old and new investment, might create a greater degree of transparency, which would better enable Ofwat to 'commit' to the required uplift (and there is precedent for this).[19] However, the short term challenge of higher customer bills would remain – as, therefore, would the pressure on Ofwat not to increase returns.

The importance of this issue, of course, is that, if efficient investment is 'stunted' in the short-term, the effect would be to store up a problem for future customers. Put simply, it would mean that 'more' investment is needed in future, **resulting in customer bills being higher over the longer term.**

2.4.2. The potential for 'less efficient' investment

In addition to the potential to create incentives that mean investment is 'below' its optimal level, the transfer of market demand risk to companies could also inadvertently result in the 'nature' of investments made by firms being less efficient.

To explain why this might be the case, it is helpful to think about some of the fundamental characteristics of water resources related investments:

- Water resource related investment is, by nature, typically irreversible (i.e. sunk). Once capital has been invested in a project, such as the construction of a reservoir, it is generally difficult to recover it. Further, to the extent that such investment is recoverable, it is likely that it would be industry-specific, and so would be of low value at the point at which it was desirable to sell it.
- Water resource assets differ with respect to their *controllability* and their *predictability.*
  - Controllability refers to the extent to which the company can control expenditure on the investment while it is being "constructed".
  - Predictability refers to the ease with which the value of the asset can be forecast. Again, the value of the asset once constructed will be determined by shocks to demand and cost, but also by regulatory policy. Underlying these as a determinant of asset value is its physical life. The longer-lived the asset, the greater its exposure to such unpredictable risks, especially as risks are more difficult to anticipate further into the future.

Table 9: Drivers of predictability and controllability

	Asset construction: Controllability	Asset value: Predictability
Key drivers	Cost shocks Lead times Lumpiness of investment Extent to which investments are sunk	Demand shocks Cost shocks Regulatory policy shocks Physical life of asset

Source: Adapted from Alexander & Harris[20] and Guthrie[21]

- Related to the above, the physical life of water resource assets is likely to be long. This means that the assets are exposed to the preceding possible shocks over a longer period, thereby further reducing their predictability.

[19] *For instance, for the construction of Terminal 5, the CAA proposed a separate cost of capital with a higher rate of return, with a higher beta value and debt premium than the rest of the airport operator (8.5% versus 7-7.5%). The CC, instead, wanted to increase the overall allowed rate of return, from 7.2% for existing assets, plus 0.3% for Terminal 5 (and 0.25% for some other issues).*

[20] *'The Regulation of Investment in Utilities: Concepts and Applications.' I. Alexander & C. Harris (2005); World Bank Working Paper No. 52.*

[21] *'Regulating Infrastructure: The Impact on Risk and Investment.' G. Guthrie (2006); Journal of Economic Literature 44:4, pages 925-972.*

- Some water resources have high operational gearing, leaving them vulnerable to cost shocks. We examined evidence that suggests that around 55% of costs in water resources are fixed.
- There are often long lead times related to planning and environmental issues. This will tend to reduce the control that firms have over their investments.

Now, suppose that Ofwat were to implement a demand transfer risk mechanism, which adjusted allowed revenues downwards in the event that actual demand was below expected demand over a defined period of time (say, the price control). Given the above features of water resources, **companies might respond to this by generally favouring smaller scale capital projects,** where:

- Asset lives are 'shorter' (because the 'predictability' of demand might be higher over shorter time horizons).
- The initial 'lead time' is reduced, because this increases the extent to which asset construction is 'controllable'.
- The investment is less 'lumpy' in nature, because this allows firms to scale back or abandon investments if shocks occur that render the project uneconomic.

The above, in of itself, might not necessarily be problematic. However, it would clearly result in detriment over the long term if the implied outcomes are 'further away' from the optimal level. For example, the cost minimising investment profile for water resources might imply investing in projects over decades – whereas the revenue adjustment mechanism might result in an investment profile with an implied horizon of, say, 5 years.

We note that a number of respondents to Ofwat's consultation raised similar arguments. For example, Severn Trent said that the transfer of market risk would: *"dis-incentivise planning for the long term – this is because medium to large supply-demand solutions, which might represent the lowest whole life cost solution, may not be funded under this proposal. This is because such assets are built with extra headroom to service future growth. Given that the capacity would not be utilised in the early stages, it would not be fully funded and hence it's unlikely companies would consider such solutions. Instead the regulatory regime would favour smaller solutions which could generate inefficient long term outcomes as they might be higher cost."*[22]

2.4.3. The potential to undermine the sustainability agenda

One of Ofwat's stated reasons for introducing the revenue correction mechanism was to provide firms with a financial incentive to increase water efficiency. Indeed, one advantage of a (total) revenue cap, from a sustainability perspective, is that firms have no incentive to seek to increase demand. This is not necessarily the case when firms bear demand risk.

In particular, suppose that a company had invested in a water resources asset, but demand was not as high as had been anticipated – for reasons associated with wider market demand, such as say, the weather. Were Ofwat to transfer demand risk to companies then, in this circumstance, the company would have an incentive to increase demand. Or, put another way, the company would benefit from a reduction in water efficiency.

Of relevance to the above, when discussing the form of price controls *relating to 'network plus'* in its May 2016 document, Ofwat said the following:

> *"We also want to acknowledge the point that a [total] revenue cap removes any incentive on companies not to promote water efficiency to customers. But as long as the marginal cost of providing additional water exceeds the associated extra revenue to the company, a price cap avoids this risk just as well."*[23]

In the case of a demand adjustment factor for water resources, however, it is easy to envisage circumstances where the benefits of avoiding any ex-post reduction in allowed revenue through the adjustment factor would outweigh the costs of providing additional water. In particular:

- If the demand adjustment mechanism is applied on the basis of *capacity* then, by definition, this a 'sunk' cost to the companies. Therefore, it is not a question of incurring further costs to provide 'additional' water. Rather, the issue is that the 'excess' capacity has already been incurred and paid for.
- Having found itself in a position of 'excess capacity' due to over-forecasting wider market demand, the only additional 'cost' a company would incur to avoid the revenue adjustment would be that associated with a reduction or postponement in its demand management activities. These costs might be close to zero in economic terms, or even negative in some cases.

[22] *'Water 2020: our regulatory approach for water and wastewater services in England and Wales: Severn Trent's Response.' (July 2016).*

[23] *'Water 2020: our regulatory approach for water and wastewater services in England and Wales.' Ofwat (2016); page 200.*

» Accordingly, it is plain that, in such circumstances, if the company could avoid the reduction in allowed revenue in this manner, it is likely to be net beneficial to do so.

The above incentive problem (for firms to seek to influence demand, or alternatively adjust their forecasts, in order to avoid a potential financial penalty, once demand risk is transferred) is well understood. For example, CC Water raised similar issues in relation to the wholesale revenue forecasting incentive, where they noted: *"There is a risk of companies deliberately reducing or increasing revenue if companies are faced with… a penalty being applied in the following year. Such company behaviour could have a detrimental impact on customers."*[24]

2.4.4. The potential to undermine Ofwat's commitment to protecting the pre-2020 RCV

A particularly important unintended consequence of the transfer of demand risk is its potential to undermine Ofwat's commitment to protecting the pre-2020 RCV. Put simply, companies have water resource assets developed both before, and after, 2020. Therefore, achieving Ofwat's stated aims of protecting the historical RCV, whilst also transferring demand risk to companies, implies that Ofwat will need to:

- shield pre-2020 assets / investments from demand risk; whilst
- exposing post 2020 assets / investments to demand risk.

A practical way of transferring demand utilisation risk would be to apply any penalty mechanism at the 'overall company' level. However, by definition this would not achieve the objective of protecting the historical RCV. This is because, if any penalty was applied to companies based on an *overall* measure of the utilisation of water resource assets, *some proportion* of that would clearly relate to assets developed prior to 2020.

The above suggests that, to achieve Ofwat's aims, the mechanism would need to be applied on an 'asset specific' basis, so that under-utilisation could be directly attributed to post 2020 assets / investments. However, it is not clear that this is possible because, whilst the capacity of water resources can be measured for specific assets (albeit not without complication) demand cannot. This is because water from specific resources all ultimately feeds into the wider 'system', and so only end-user water demand is truly measureable. Therefore, **it would not seem to be possible to directly measure demand utilisation in a way that properly delineates between pre- and post-2020 assets / investments.**

To address the above, one might consider 'allocating' demand to specific water resources assets (or pre / post 2020 RCV). This, however, would seem to have problematic implications for efficiency incentives – because it is not clear how any allocation method would be able to reflect 'which' investments (i.e. pre or post 2020) were, in fact, efficient or inefficient. Therefore, the clear risk is that adopting an 'allocation' approach **could result in penalties applying in cases where post-2020 investments were entirely efficient.** One might, therefore, 'discourage' investments that were actually beneficial to customers (again meaning that customer bills are higher in the long run).

It should be noted that **Ofwat itself has highlighted the obvious tension between transferring demand risk in water resources whilst seeking to protect the historical RCV.** Indeed, Ofwat raised this when discussing the suitable 'form of control' for water resources.

Following from the above, if a regulator wished to transfer demand risk, the simplest way of doing this would be to apply an *'average revenue control'* rather than a *'total revenue control.'* In its May decision document, Ofwat rejected the option of applying an average revenue approach to water resources, on the following grounds:

"An average revenue control could also expose incumbent water companies to considerably greater financial risk, such as full exposure to variations in the aggregate level of demand for water** within each WRZ. This would involve a major change to the price control framework for water resources, which seems out of proportion with the likely scale of bilateral market entry in the near term. **It would also reduce transparency around implementing our policy to provide regulatory protection for the pre-2020 RCV."[25]

There would seem to be a degree of tension, therefore, between Ofwat's rationale for discounting an average revenue control approach, and its proposals relating to demand risk in water resources. Clearly the challenge regarding RCV protection (given as a reason for discounting the average revenue control approach) applies in both cases.

[24] *'The revenue forecasting incentive mechanism for AMP6: an Ofwat consultation paper.' CC Water (2014); page 1.*

[25] *'Water 2020: our regulatory approach for water and wastewater services in England and Wales Appendix 3 Tackling water scarcity - further evidence and analysis.' (2016); Page 19.*

The importance of Ofwat's commitment to the pre-2020 RCV is well understood. Namely, whilst it is entirely legitimate for regulation to evolve in a way that changes the balance of risk and reward over time, retrospective changes to the risk profile of investments *already made* are highly undesirable. This is because they undermine trust in the regulatory contract, and so increase regulatory risk for investors and therefore, over time, the WACC – leading to customer harm.

Of course, we should also acknowledge that a solution may exist that would resolve the apparent tension with Ofwat's key policy commitment to the pre-2020 RCV. It does seem, however, that the inability to observe demand in relation to specific assets appears to make this challenging.

The implications that flow from the above would seem to be that:

- Notwithstanding the broader concerns set out here as to whether the transfer of (market) demand risk to companies is likely to be beneficial for customers, the policy is only viable if a solution is found that is compatible with protecting the historical RCV.
- Given that the commitment to the historical RCV is a key element of Ofwat's approach at PR19, it would seem logical that responsibility for identifying a solution should primarily rest with Ofwat.
- Related to the above, the rationale for Ofwat having responsibility is increased further by the need for any demand utilisation risk mechanism to be applied consistently across companies. This is because, if each incumbent were to design and implement its own methodology for measuring asset utilisation, this could result in, for example, penalties being applied inconsistently across firms, with some firms effectively being exposed to more demand risk than others. This could result in some firms earning higher returns than intended, while others would have their investment incentives dulled. This could also undermine Ofwat's goals with respect to encouraging competition and entry. Note, the need for a *consistent method* for applying demand risk is entirely separate from our subsequent discussion as to whether companies should be free to *volunteer* whether to be exposed to demand risk in the first place.

Finally, we should note that this particular 'unintended consequence' challenge arises both in relation to the transfer of the *competition* and *market* element of demand risk. However, Ofwat's proposed unfocused approach to RCV allocation would seem to imply that this issue more acute in relation to the transfer of market demand risk.

2.4.5. The potential to 'cut across' direct procurement for customers

In our view, it would also seem possible that the transfer of *the competition element* of demand risk to companies could (inadvertently) undermine Ofwat's proposals relating to direct procurement to customers. In the following we briefly outline why this could be the case.

- Ofwat has set out that it expects companies to make greater use of 'direct procurement' on the part of their customers for the development of new assets. This refers to circumstances in which companies seek bids from third parties and select the option that is best value for their customers. Under such arrangements, bidders compete both to finance and construct the asset, and possibly also to operate it.
- Ofwat has said that, from PR19, it expects companies to consider direct procurement for all discrete, large-scale enhancement projects with a value of more than £100 million. Ofwat has further indicated that its preferred approach is to encourage companies to use direct procurement by using its risk-based review process to assess the extent to which direct procurement has been considered. Companies would then have to justify not having used direct procurement for any projects above the guideline threshold.[26]

In the above context, companies might view the use of 'direct procurement' for customers as a means by which rivals can build capacity that can subsequently be used to 'displace' their own water resource assets (in relation to investment made after 2020). Consequently, by passing the competition element of demand risk to companies, those companies may have an additional incentive not to make use of third party solutions – therefore potentially undermining Ofwat's direct procurement proposals.

The extent to which the above issue would arise in practice clearly depends on a number of factors – most obviously the extent to which Ofwat's Risk Based Review can accurately identify the circumstances under which a third party solution would have been most efficient in order to prevent or deter incumbent companies from excluding them unduly (say, to deter competition).

Here, it is also worth re-emphasising the fact that the transfer of competition related demand risk is less

[26] *'Water 2020: Regulatory framework for wholesale markets and the 2019 price review. Appendix 5: Enabling direct procurement for customers – further evidence and analysis'. Ofwat (2016); page 2.*

contentious more generally. Consequently, the potential concern outlined here is less material than the other forms of unintended consequence described previously.

2.5. What are the potential benefits arising from stronger incentive power?

As we set out previously, deciding on the allocation of demand risk requires trading off the benefits of potentially stronger incentives on firms with the higher resulting cost of capital and sub-optimal outcomes arising from unintended consequences.

In considering the benefits in particular, one needs to be aware of the impact of alternative regulatory options (which we address in Chapter 3) – and the extent to which there might be *duplication* across regulatory tools. Putting the risk of duplication to one side, below we briefly discuss the 'in principle' benefits.

2.5.1. Cost efficiencies

The introduction of demand risk has the potential to increase the efficiency of both operating and capital costs. In the extreme case, if regulated firms were completely isolated from any revenue risk, with allowed revenues equal to costs incurred, then firms would not face the prospect of being unable to recover the cost of an inefficient investment, and would, therefore, gain no benefit from reducing their costs.

In practice, water regulation has been designed in such a way as to provide firms with strong incentives to reduce both operating and capital costs. Ofwat conducts assessments of the efficient levels of operating and capital costs (totex), and firms have incentives both to avoid overruns of these amounts, and to improve their cost performance, as they can retain some of the benefits of outperforming assessed costs.

Such cost assessments are, of course, imperfect. Therefore, introducing demand risk *arguably* has the potential to heighten these incentives. Importantly, the scale of *additional* benefits therefore depends on the extent of uncertainty over cost assessments – that is: the benefit of transferring demand risk is likely to be greater the less reliable one believes cost assessment to be.

In the context of water, though imperfect, cost assessments do benefit from the ability to benchmark companies' performance against the highest performing companies. Also relevant is the fact that firms have made significant improvements in efficiency since privatisation, so the overall scope for improvements may be more limited. Nonetheless, we recognise that there may be some incremental cost efficiency incentive power associated with the transfer of demand risk.

2.5.2. Output targeting

In addition to incentives to increase cost efficiency, the introduction of demand risk has the potential to improve firms' incentives to produce the outputs that consumers value most.

The benefits of inducing better targeted outputs will clearly be greatest when consumer preferences are heterogeneous. Relative to other sectors, however, the water industry is one where one would expect customer preferences to be relatively homogenous, Therefore, the potential scale of this 'in principle' benefit, would logically seem to be modest in relative terms. It is also not clear that the transfer of demand risk would be the most appropriate tool to realise this benefit in any case. Relative, for example, to the broader outcomes framework – including bespoke outcome delivery incentives.

3. Implications for Regulation

We have established that assigning market driven demand utilisation risk to firms will increase the cost of capital, and is also likely to affect both the amount and nature of investment in water resources. Accordingly, this final chapter sets out our recommendations in relation to the implications for future regulatory design.

Overall, our analysis suggests that **there is no prima facie reason for transferring the 'market' element of demand risk to companies.** Specifically:

(i) Based on the evidence, it seems likely that **the costs of fully transferring the market element of demand risk will outweigh the benefits.**

(ii) Even if one did not believe the above was the case, **there are already regulatory tools in place to address the relevant issues** (most notably the totex approach) which do not carry the same identified downsides.

(iii) If market driven demand utilisation risk is to be transferred to companies, **it should be limited in its magnitude.** However, this is practically challenging – further supporting 'no transfer' at all.

3.1. What are the implications of transferring demand risk to companies?

Based on the evidence set out in this report, our views on the implications for the potential transfer of demand risk to companies (relating to water resources) are as follows:

- Whist **the transfer of the competition (bilateral) element of demand utilisation risk to companies might be assumed not to increase systematic risk,** this will not be the case for any transfer of the 'market related' element of demand utilisation risk.
- Therefore, while the transfer of the competition element of demand risk to companies might be considered *less* contentious, **the question as to whether, and to what extent, the market element should be transferred is complex.**

Following from this:

- The above question **rests on an assessment of the potential 'costs' (including a higher cost of capital) and the potential benefits** associated with stronger incentive power.
- In our view, when the relevant issues are considered *in relation to water resources,* **the benefits of transferring the market element of demand risk to companies are unlikely to outweigh the costs.** Importantly, this chimes with the basic principle of when, and where, one would typically use 'high powered' regulatory incentive approaches – which is normally where the need to secure long-term sunk investment is less important. This is clearly not the case in water resources.
- In particular, we find that the potential increase in the beta associated with any transfer of the market element of demand risk could be material – and furthermore, that it could lead to unintended consequences, which **could also give rise to customer detriment and environmental harm in the long run.**
- Consequently, our view is that there is not a strong '**prima facie**' reason for transferring the *market driven element* of demand risk to companies.
- We also recognise that the above is a matter of degree (i.e. because, as identified by Ofwat, the regulator could choose to allocate only a proportion of market demand risk to companies). In this regard, we would suggest that *if* Ofwat were to transfer market demand risk to companies, **the evidence strongly points to the need to substantially 'limit' the extent of any exposure.**

We note that our findings and evidence are consistent with the majority of views as expressed in response to Ofwat's consultation questions regarding this policy, which were set out in its May 2016 decision document. Specifically, 10 out 15 respondents (which included both companies and other stakeholders) did: *"not agree that new capacity should be exposed to some market-wide demand risk."*[27]

3.2. Are there any alternatives that would achieve Ofwat's objectives for water resources?

Even if one took the view that the benefits of transferring the market element of demand risk to companies outweighed the costs, one would still need to consider whether there might be alternative measures that could achieve same ends at lower net cost (most obviously, by avoiding any unnecessary increase in the cost of capital). In the following we therefore briefly consider what alternative mechanisms and options might already exist.

3.2.1. Incentives for cost minimisation

We previously noted that giving firms better incentives for cost minimisation is one rationale for handing them demand risk. This has often been a concern in regulated industries, particularly the possibility that firms have incentives to use more capital-intensive options than is efficient. For example, there is one school of thought that suggests regulators have tended to set the cost of capital above their central estimate, due to a belief that the downside of 'too high' prices is less problematic than the possibility of firms not being able to invest (which might be linked to the fact that regulators typically have financeability duties). If this were the case, capital additions could generate returns above their opportunity costs – thus contributing to the theoretical possibility of 'capex bias.'

We note, however, that Ofwat has already sought to address this issue by moving to a 'totex approach' at PR14. Accordingly, over time, this should deliver stronger cost minimisation incentives, as firms better optimise between opex and capex solutions. As cost minimisation is one of the potential benefits of transferring demand risk, it would seem prudent to allow the full impact of the totex approach to become

[27] *See summary slides from 'Ofwat water resources working group.' Meeting on 25 July 2016.*

clear before implementing a further tool designed (in part) to address this issue.

In this context, it is worth noting that in his 2009 review of the Water Sector, Martin Cave said: *"mindful of the critical impact of financing on investment and customer bills… the Review supports a step-by-step approach [to reform] starting where the risk-return ratio is most favourable."*[28] In relation to the potential problem of over-investment (capex bias), in his final report Cave favoured the removal of the traditional capex / return approach (i.e. his views are, therefore, consistent with Ofwat's implementation of the totex approach). Nowhere in the review, however, did Cave suggest that the transfer of market demand risk to companies was a means of addressing this cost minimisation problem.

3.2.2. Forecasting

If firms' revenues are guaranteed, they have little incentive to accurately forecast consumption volumes. On the other hand, more accurate forecasting could enable greater cost efficiency. Imposing demand risk on firms could increase their incentives to make accurate forecasts; and thus help to increase cost efficiency.

On the other hand, we note that there is already a wholesale revenue forecasting incentive. This adjusts companies' allowed revenues to take account of differences between actual and projected revenues, and gives companies an incentive to avoid revenue forecasting errors by applying a penalty to variations outside of a set band. Ofwat's stated objectives and rationale for the wholesale revenue forecasting incentive would appear to overlap closely with its rationale in relation to the transfer of market driven demand risk. Specifically, in explaining its motivation for the wholesale revenue forecasting incentive Ofwat said:

> *"We propose a new WRFIM in order to better incentivise companies to improve their revenue forecasting within the new more flexible wholesale revenue controls."*
>
> *"We also want to ensure that… demand risk is shared more fairly with current customers and not all shifted to customers in the future."*[29]

We note that this, as an incentive mechanism, appears to have some advantages compared to more explicitly imposing market demand risk on firms. Specifically, penalties only apply when variations fall outside a set uncertainty band. This mitigates, though does not eliminate, the extent to which firms are exposed to systematic risks.

Put simply, there appears to be a high degree of overlap and duplication between the aims of the wholesale revenue forecasting incentive, and Ofwat's current proposal to transfer some proportion of the market driven element of demand utilisation risk to companies. Given this, and the downsides identified previously associated with the transfer of demand risk, this would seem to further call into question the rationale for proceeding with any market risk transfer.

3.3. How should a demand transfer mechanism work in practice?

The primary scope of our work for Southern has been to identify and evaluate the key issues in relation to the potential *impact* of any transfer of demand risk to companies (in water resources). More specifically, our primary focus has been on evidence relating to the cost of capital. We have not, therefore, considered issues relating to the practical design of any demand risk transfer mechanism in any detail. Nevertheless, at a high level, our findings do have some clear implications for how any such mechanism should be designed. Again, here our focus is very much on the *market* element of demand risk.

Accordingly, the key implications are as follows:

- Firstly, the overall approach would need to explicitly 'limit' the extent of any market demand risk transferred to companies. There are a number of ways of doing this, which we briefly outline below.
  - Instead of having an explicit mechanism, **Ofwat could operate a 'voluntary' approach,** where companies could *choose* whether to expose any specific new investments (post 2020) to demand risk, in exchange for a higher cost of capital *that would apply just to those investments.* In order to address the problem of identifying the appropriate cost of capital to compensate for market demand risk, this voluntary approach could be combined with a WACC 'bidding' framework (e.g. companies could propose the WACC uplift they want in order to accept demand risk, and Ofwat could pick 'winners'). **The rationale for a 'voluntary approach' is further enhanced by the fact that investors in incumbent companies may have a different (lower) appetite for risk than investors in any**

[28] *'Independent Review of Competition and Innovation in Water Markets: Final Report.' Martin Cave (2009); page 10.*

[29] *'Consultation on the revenue forecasting incentive mechanism for AMP6.' Ofwat (2014); page 3.*

entrants into water resources. Potential entrants are, of course, free to enter or not, depending on whether they think the risk / reward pay-off is appropriate (i.e. as noted earlier their returns are not limited by a price control). Importantly, of course, we do not currently know whether the fundamentals of water resources (including market demand risk) will be conducive to entry and competition 'in the market'. A benefit of Ofwat's broader approach to the regulation of water resources is that by, *allowing for the possibility of bilateral competition,* we can observe and learn as to whether this is the case or not. The key point, however, is that if potential entrants consider demand (or other risks) to be 'too great' relative to the rewards, they will not enter. In contrast, incumbents are not able to exit the provision of water resources. This would strongly point to making the allocation of market related demand risk to companies optional, to reflect their risk / reward appetite. Note, this same rationale underpins why, in the retail NHH market, it was considered important to allow incumbent companies to exit.

- Ofwat could transfer market demand risk **using a mechanism along the lines of that already outlined for the transfer of bilateral (competition) related demand risk – but include an explicit 'limit'** on the extent of demand risk being transferred. This could be done by:
    - limiting the incentive to apply to only a proportion *of the forecast error* for demand;
    - limiting the incentive to apply to only a proportion *of overall future investment;*
    - limiting the incentive to apply only to *certain elements of market driven demand utilisation risk* (e.g. excluding market risk due to the weather, say).
- Secondly, the approach **would need to explicitly address the potential for unintended consequences** – for which the practical considerations would seem to include **ensuring that the time horizon over which the 'gap' between forecast and realised demand was assessed was sufficiently long** to ensure that companies had appropriate incentives to optimise costs over the longer term. Importantly, **in our view, the application of a 'demand risk' mechanism applied over a longer term time horizon could also mitigate the potential increase on the cost of capital, as previously described in this paper.** However, as we summarise subsequently, if the issue that Ofwat is seeking to address here is a more 'fundamental' overstatement of demand by companies, solutions other than a 'demand risk' mechanism would seem to be more appropriate.

Our overall view is that successfully designing and implementing an approach that appropriately identifies and transfers just *some* element of market driven demand utilisation risk appears highly challenging. The risk of regulatory failure appears non-trivial: *how could Ofwat be sure that it was transferring just the 'right' amount?* Given this, and the evidence outlined previously, our view is that the most appropriate solution is simply not to transfer the market driven element of demand risk at all.

3.4. Further consideration of the 'problem' that needs to be addressed

It may be that the issues highlighted in this report stem, in part, from **a need for further consideration and clarity regarding the 'problem' that needs to be resolved.**

Following from the above, if Ofwat believed that companies might have, in some fundamental sense, overstated demand in order to justify new water resource investment, that would be clearly be a legitimate concern, which would need to be addressed (as the customer harm could be considerable). However, if this was the 'issue', then the solution would not seem to be 'mechanical' financial penalties based on differences between capacity and demand measured annually (or even over five years). Indeed, for the reasons already set out here, such an approach could very well harm customers. Rather, in this case, it would point more towards solutions rooted in the price control process itself, including, for example, how enhancement spend is assessed. One might also potentially consider explicitly building asset utilisation measures into the Risk Based Review process. Again, however, one would need to take care to ensure that any RBR tests that were applied reflected a sufficiently long-term assessment of utilisation to avoid unintentionally harming customers.

If, on the other hand, one did not think that companies were, in such a fundamental sense, intentionally overstating their need for resources, but rather, there was scope to improve forecast accuracy, alternative solutions might be considered. Logically, these solutions would need to start from a diagnosis of 'why' some companies' forecasts were more accurate than others – from which incentive mechanisms could be designed that directly rewarded or penalise

companies for forecast accuracy. As above, however, care would be needed to ensure any such mechanisms were applied in a manner consistent with optimising water resource investments *over the longer term.* Again, a mechanical approach that applied penalties based on the difference between capacity and demand would not seem to address the underlying issue.

In summary, we think it is important to acknowledge that Ofwat may have legitimate concerns regarding whether water resource investment is as efficient as it could be – and therefore, whether there is scope to do even better for customers. However, at present the identified issues are not consistent with a solution based on transferring (market) demand risk to companies. We would therefore encourage:

- Firstly, further consideration of the 'problem' – **including evidence and analysis to demonstrate the 'scale' of the problem** and the potential 'harm' it causes. For example, establishing whether in fact there is material over-capacity in the industry at present, and why, would seem to be important steps.
- Secondly, **identifying solutions that are mapped to the problems** – with a clear rationale and evidence as to why those solutions are appropriate and are likely to deliver the best outcomes for customers and the environment.

4. Appendix A -how demand risk affects systematic risk

This appendix provides further details of how demand risk can impact systematic risk, and how the design of regulatory price controls relates to this.

Demand risk for price-controlled firms

One of the key choices that regulators have to make is the extent to which regulated firms are exposed to demand or volume risk. Introducing such risk means that firms' revenues can vary with demand for their products or services. If this demand is correlated with changes in the wider economy, this will increase firms' systematic risk (and, therefore, the cost of capital).

To illustrate how demand risk affects the returns that investors require, it is helpful to think about a company as an 'asset' that generates cash flows. Accordingly, the value of the company can be expressed as the present discounted value (PDV) of these cash flows. This is, in turn, is equal to the PDV of the firm's revenue, less the PDVs of variable costs and fixed costs – as illustrated below:

$$A = R - VC - FC$$

where A is the PDV of the asset's cash flows, R, VC, and FC are the PDVs of revenues, variable costs and fixed costs, respectively.

To see how demand risk affects *overall* systematic risk, note that the equation above implies that the beta of the asset, that is to say its systematic risk, can be decomposed into a weighted sum of the betas of the asset's revenues, variable costs and fixed costs, as shown:

$$\beta^A = \frac{R}{A}\beta^R + \frac{VC}{A}\beta^{VC} + \frac{FC}{A}\beta^{FC}$$

The beta of fixed costs is, by definition, zero. To simplify the analysis, assume that the only revenue risk that the firm faces is with respect to volume – that is to say that its prices are fixed and there are no wider systematic regulatory risks to revenue. In this case, if a regulator does not expose the firm to demand risk, then all of the systematic risk it faces will be with respect to cost.

$$\beta^A_{RC} = \frac{VC}{A}\beta^{VC}$$

If, however, the regulator decides that the firm should be exposed to demand risk, then its systematic risk will be:

$$\beta^A_{PC} = \frac{R}{A}\beta^R + \frac{VC}{A}\beta^{VC}$$

Where the systematic risk associated with the firm's revenues is given by:

$$\beta^R = \frac{\sigma(\%\Delta q, r_M)}{\sigma^2(r_M)}$$

Importantly, it is only the systematic component of demand risk that is relevant to the cost of capital. If a regulator exposes a firm to demand risk that is not correlated with changes in the wider economy, there will be no change in its cost of capital.

Systematic and non-systematic demand risk

In practice, demand can depend on a range of factors that differ from industry to industry. These include:

- the price of the good in question;
- the price of similar goods from alternative sellers;
- the extent of competition and availability of alternative goods;
- the quality of the good;
- consumers' preferences;
- consumers' incomes; and
- the weather.

Together, these factors drive demand risk, but to what extent can they be regarded as contributing to *systematic* demand risk?

In the context of *regulated firms,* prices are often (to some degree) fixed by regulators' decisions. In this case, variation within review periods is therefore zero, and there is no correlation with changes in the wider economy. There may, however, be some correlation of the prices set *between* review periods with wider economic conditions (if, say, regulators are put under pressure to keep prices low during times of economic stress).

In the context of water resources, where Ofwat is explicitly seeking to facilitate the development of markets (including 'in the market' bilateral competition) the extent of competition may become a relevant determinant of prices, and more generally will determine the demand that each firm faces. Competition can affect firm-level demand without

having any impact on market-wide demand. As such, it is (from a theoretical perspective) typically considered unlikely to materially affect systematic risk.

To see why, suppose that competition in a market increases due to a new entrant. If one had invested in a single firm in the market, then one could undergo a reduced return. One could, however, diversify one's portfolio and invest in the new entrant. For an investor with a diversified portfolio, this increase in competition does not, therefore, make a difference (although it may change the optimal weights of the portfolio).

A key implication of the above is that demand risk that occurs as a result of increased competition is unlikely to have a material effect on systematic risk, and therefore the cost of capital. Following from this, Ofwat's proposal to transfer demand risk relating to bilateral competition to companies, should be considered *less contentious.* Accordingly, our primary focus in the potential implications of transferring *market* demand risk to companies.

Focusing on market demand utilisation risk

Returning to the other factors that could affect demand, in and of itself, quality is unlikely to have significant correlation with the wider economy. Consumers' preferences, on the other hand, have the potential to have significant correlation with market conditions, depending on the good in question.

Of the drivers of demand detailed here, consumers' incomes are most obviously correlated with conditions in the wider economy, and are likely to be a key source of systematic demand risk. The weather is likely to have a material effect on overall economic activity, and the effect is likely to be pronounced for some particular firms. This could also drive systematic demand risk.

Table 10: Determinants of demand risk and extent to which they are systematic

Drivers	Determinant	Correlation with market
Price of the good	Regulation, extent of competition	Low
Price of alternative goods	Regulation, extent of competition	Low
Competition	Market structure	Low
Quality	Firm choices	Low
Consumers' preferences	Tastes	Medium
Consumers' incomes	Wider economic conditions	High
Weather	N/A	Medium

Source: Economic Insight

Regulators' objectives and the form of control

Economic regulators' objectives and duties are usually laid down in statute and often include components relating to the promotion of competition and the protection of consumers' interests. Where these duties involve the setting of formal price controls, as is the case with Ofwat, this typically involves setting an 'allowed rate of return'. This is often expressed in terms of the cost of capital, which depends on the extent of systematic risk, as described above.

A critical point to understand, however, is that the extent of systematic risk faced by regulated firms, is itself a function of the regulatory framework. That is to say, whilst (in very broad terms) regulators may seek to use price controls in order to achieve outcomes consistent with their aims and duties, they have considerable discretion as to the detail of *how* this is done. For example, a regulator wishing to *constrain* market power retains freedom as to the *form* that any regulatory control takes. In turn, the extent of demand risk (some of which may be systematic) faced by firms will vary, depending on how the regulator designs any such control. For example, a regulator could:

- Fix the firm's **rate of return** on its assets. In practice this involves setting the firm's prices such that they generate the fixed rate of return. In this case, the regulated firm is subject to *no demand risk.*

- Fix the firm's **total revenue.** In this case, the regulated firm *will generally not be exposed to quantity risk.* If quantity falls, the firm can increase its prices. The only residual demand risk relates to the possibility that price increases further reduce demand, but this is typically regarded as being unlikely, given the need to regulate the firm in the first place.
- Fix the firm's **price(s).** In this case the regulated firm usually has the amount it can increase (a basket of) its price(s) capped. In this case the firm *will be exposed to demand risk,* as falls in demand cannot be compensated for by higher prices.
- Fix the firm's **average revenue**. This functions similarly to a price cap, with the firm *also exposed to demand risk.*

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