

REFERENCE OF THE PR24 DETERMINATIONS

Submissions of the Thames Water Investor Group on the issues raised in the five Ofwat references

Annex 1: History and status of Thames Water's restructuring

1. Introduction and Summary

- (1) This annex describes the ongoing restructuring of Thames Water Utilities Limited ("**Thames Water**" or the "**Company**"), outlining the role of the Investor Group and the context of the current restructuring efforts. The Investor Group is comprised of over 100 financial institutions who hold in excess of £13 billion of Thames Water's Class A debt. The Investor Group has significant debt holdings in other regulated UK water companies and represents a significant proportion of the debt capital markets in the sector. Debt provided by members of the Investor Group is expected to play a significant role in meeting the unprecedented funding needs of the sector in AMP8 and beyond.
- (2) Given that the water companies currently facing redetermination have in their submissions to the CMA referred to issues which cut across to Thames Water,¹ as further described in this paper, and it seems likely that some third parties (including Thames Water itself) will address similar points in their submissions, we consider it important to ensure that the CMA has a clear, accurate and direct account of these events, as part of its understanding of the wider industry. This information is provided to the CMA to give it a simple explanation of the position of the Investor Group and its ongoing commitment to Thames Water.
- (3) The Investor Group has substantial investments in Thames Water and in the water sector more broadly – which means that its interests align with other water companies in seeking a sustainable financeable settlement. The Investor Group therefore want to ensure that the price control framework strikes the right balance between risk and reward so that all water companies are investable, financeable, resilient and able to serve their customers and protect the environment. The Investor Group's position within the market means it can offer the CMA a valuable and unique insight into the financing of the water sector, and its input into the PR24 redetermination process will help ensure that the CMA has all the relevant facts at its disposal.
- (4) Moreover, members of the Investor Group hold investments across various UK regulated infrastructure sectors that operate under similar price control frameworks. The CMA's decisions and approach to the PR24 redetermination process will inevitably influence investor confidence in the broader UK regulated infrastructure landscape – particularly as other significant reviews are approaching, such as the RIIO-3 price controls for energy networks in 2026. At a time where the UK seeks to attract substantial capital, maintaining a sensible and consistent regulatory

¹ **AMP7 overspend:** Anglian SoC paras 6(lii)(b), 32, 46, 143. Northumbrian SoC paras 8, 21, 139-140, 180-182, 448. South East SoC para 2.55(b). Southern SoC Chapter 2 paras 350, 367, and Chapter 3 para 30.

AMP7 penalties: Anglian SoC paras 58, 247(iv), 531, 554. Northumbrian SoC paras 400, 417 – 419, 452. South East SoC para 2.55(a).

Rising cost of regulatory obligations: Anglian SoC paras 456, 648-649.

environment is essential for sustained investment and to ensure regulation supports the government's core growth mission.

2. Thames Water's Financial Challenges and the Investor Group Response

- (5) The restructuring of Thames Water must be understood within the context of the significant financial challenges that have threatened the Company's ability to operate. The Company has generated negative operating free cash flow ("FCF")² every year since the start of PR14 in April 2015, totalling a £2bn outflow over the subsequent nine years to March 2024. This is a pattern that has lately worsened with negative operating FCF of £614m reported in the financial year 2023/24.³
- (6) Thames Water's financial challenges have culminated in the need for a substantial financial restructuring:
- (a) In March 2024, Thames Water's shareholders declined to provide £750 million worth of funding.⁴ In April 2024, events of default occurred under the financing arrangements for Kemble Water Finance Limited, an indirect holding company of the parent group, and its financing subsidiary Thames Water (Kemble) Finance plc.⁵
 - (b) By September 2024, Thames Water announced it would run out of money by December 2024 and would enter into a "standstill" period under its financing arrangements if no action was taken.⁶
 - (c) Thames Water also faced imminent debt maturities, particularly \$285 million (USD) of Class A senior notes due on 22 March 2025, non-payment of which would have triggered an Event of Default.⁷
 - (d) Without a market-based solution, Thames Water faced the likelihood of being subject to a Special Administration Regime ("SAR"), with the potentially severe consequences for customers, the environment, and the sector as a whole.
- (7) As these pressures mounted, it became necessary to consider a different approach to address the problems at the Company. When the shareholders effectively withdrew their support of Thames Water in March 2024, the Investor Group, a very significant number of whom had invested in the

² Cash flow from operations (before interest and tax) minus net cash capital expenditure. Over the nine years to March 2024 net cash capital investment of £12.1bn exceeded cash flow from operations of £10.1bn.

³ Thames Water Utilities Limited Annual Report 2023/24, page 45.

⁴ *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch), paras 15, 30-31.

⁵ Thames Water Utilities Limited Annual Report 2023/24, page 111.

⁶ *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch), para 66.

⁷ *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch), para 15.

Company when it was considered a stable ‘investment grade’ investment, recognised that coordinated approach was necessary to both protect their investments and prevent a SAR.

- (8) A SAR would have been, and would be, a bad outcome, not only for Thames Water but also for the broader water sector and for UK infrastructure investment generally – it would likely result in significant value destruction, and heightened uncertainty in the capital markets which could potentially lead to an increased cost of capital across the water sector. Ultimately this also affects/harms/negatively impacts consumers through higher bills as a consequence of reduced investment capacity.
- (9) It is critical to understand that, as creditors, the members of the Investor Group do not control the Company’s governance and decision making.
- (10) The Investor Group has, however, responded proactively to Thames Water’s financial challenges, demonstrating significant commitment to ensuring the Company’s continued operation through substantial financial restructuring:
 - (a) **Urgent Financial Intervention (the Interim Platform Transaction, “RP1”):** By October 2024, the Investor Group had successfully negotiated and executed agreements which provided critical funding and also released approximately £400 million of trapped cash, which was essential to extend Thames Water’s liquidity runway to March 2025. RP1 provided immediate liquidity of £1.5 billion (with a potential for an additional £1.5 billion) – a commitment of up to £3 billion in super senior funding to Thames Water.⁸
 - (b) **Maturity Extensions:** The Investor Group agreed (pursuant to RP1) to extend the maturity dates of existing debt by two years, providing critical breathing space for the Company to develop a long-term solution.⁹ This prevented an Event of Default that could have triggered a SAR event.
 - (c) **Acceptance of Future Restructuring (Long-term Recapitalisation, “RP2”):** Having injected more money into Thames Water through RP1, the Investor Group is now actively negotiating a more comprehensive restructuring (RP2) as described below.

3. Current Status and the Path Forward

- (11) RP1 was sanctioned by the High Court¹⁰ and upheld by the Court of Appeal,¹¹ which provided immediate liquidity and averted a SAR event. As part of RP2 described above, an equity raise process is ongoing with KKR as the preferred partner. Importantly, the Investor Group is committed to investing new capital into Thames Water, either alongside KKR or – should the KKR bid not

⁸ *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch), para 92.

⁹ *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch), para 92.

¹⁰ *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch), para 309.

¹¹ *Kingston S.À.R.L., Thames Water Limited and Mr Charles Maynard MP v Thames Water Utilities Holdings Limited* [2025] EWCA Civ 47

proceed – through an alternative structure where all the new equity would come from the Investor Group and other creditors. Ultimately, RP2 seeks to establish a sustainable capital structure and a return to an investment grade credit rating for Thames Water¹²

- (12) Thames Water and Ofwat have now agreed that Ofwat will defer making Thames Water’s CMA reference for a period of up to 18 weeks from 18 March 2025 to 22 July 2025 in order to explore options to unlock a market led solution for the recapitalisation of the Company.
- (13) The Investor Group are confident that a long-term equity solution and RP2 are achievable, but that it will require:
 - (a) a substantial balance sheet restructuring; and
 - (b) a sustainable regulatory settlement which enables investment with acceptable risk exposure.
- (14) The Investor Group’s commitment (alongside other senior secured creditors) of up to £3 billion in new funding represents a significant vote of confidence that, once recapitalisation is achieved, Thames Water will achieve long-term viability. This commitment stands in stark contrast to narratives suggesting creditors are seeking to extract value. In reality, a balance sheet restructuring is likely to be needed as part of a long-term solution and commitment to Thames Water and the sector more broadly.

¹² Court testimony from David J Burlison “on a recapitalisation, new money will go in, the balance sheet will be right sized and therefore all this will get factored into the final restructuring and therefore it is the creditors that end up paying this.” Para 303 *Re Thames Water Utilities Holdings Ltd* [2025] EWHC 338 (Ch).

REFERENCE OF THE PR24 DETERMINATIONS

Submissions of the Investor Group on the issues raised in the Ofwat references of the five Disputing Companies

Annex 2: The Investor Group's interest in these redeterminations and its submissions on the statements of case of the five disputing companies

1. Investor Group's interest in the redeterminations

- (1) The Investor Group is comprised of over 100 financial institutions who hold in excess of £13 billion of Thames Water's Class A debt. The Investor Group has significant debt holdings in other regulated UK water companies and represents a significant proportion of the debt capital markets in the sector. Debt provided by members of the Investor Group is expected to play a significant role in meeting the unprecedented funding needs of the sector in AMP8 and beyond.
- (2) The Investor Group:
 - (a) is involved in ongoing negotiations over the restructuring and future long-term financial viability of Thames Water; and
 - (b) is working intensively to develop a market-based solution to achieve a financial restructuring and recapitalisation of Thames Water that will provide a robust basis on which to execute a successful turnaround of the company.
- (3) As holders of debt in the water sector more generally, the Investor Group has an interest in the outcome of each of the five requests for a redetermination in so far as that has an impact on the sector as a whole. In addition and in particular, any decisions the CMA takes in respect of the other five water companies' (the "**Disputing Companies**") requests for redeterminations have the potential to affect the way in which the CMA views the Thames Water redetermination; and hence are of interest to the Investor Group. In making their submissions, the Investor Group are therefore focused on ensuring that any progress made by the CMA does not impair the ability of Thames Water and its creditors to make their points and for the CMA to consider those points with an open mind, if and when a reference to the CMA is made in respect of Thames Water.
- (4) The enactment of the recapitalisation proposals together with a redetermination of the PR24 price control as applied to Thames Water will bring about substantial benefits for all key stakeholders, including customers and the environment. Conversely, a SAR, were it to occur, is likely to be a highly uncertain and value destructive process, both in terms of duration and outcome and would likely cause significant loss and disruption to all the Company's stakeholders, including customers.

2. Approach the CMA Should Adopt

- (5) The five cases before the CMA (and Thames Water's anticipated reference for a redetermination) have one high-level perspective in common: they are all seeking the resources they need to make necessary investments to address the rising requirements on and risks facing water companies. The serious predicament the UK water sector finds itself in – in which the role of the regulatory framework plays a key role - is a common theme. The lack of sufficient long-term thinking and

regulatory consistency in the current regime is undermining resilience and increasing uncertainty and risk for the sector. There is a recurrent and widespread concern that insufficient weight has been given to evidence over notional assessments or modelling, leaving companies unable to fund vital tasks. The CMA must take proper account of the risk to return on capital in the sector and the Final Determinations so as to avoid undermining the future investments needed. Differences of view between the water company appellants on their approach to the CMA or points of detail should not distract the CMA from tackling that common problem head on.

- (6) Inevitably this underlying common theme manifests in different ways for different companies. The mere fact that one of the redetermining water companies does not challenge its allowance for, for example, P-Removal, whereas others do, does not mean that the allowance is correct for the first company. As a general matter, the CMA will want to consider these different cases differently:
 - (a) **Cases where a redetermining company is seeking cross-cutting remedies such as proposing changes to base modelling which could impact other companies (either positively or negatively):** for any proposed remedy or change that falls into this category, the CMA should exercise caution. It may not be the case that the same approach is correct in all cases.
 - (b) **Cases where only a company-specific adjustment is sought:** in these cases the cross-sectoral error risk is lower and the CMA may feel more confident about making the changes requested (with the caveat that the underlying analysis may also be relevant to other companies, even if there is no direct financial impact of the change).

3. Submissions on the statements of case of the five disputing companies – introduction and summary

- (7) Anglian Water, Northumbrian Water, South East Water, Southern Water, Wessex Water (the “**Disputing Companies**”) submitted their statements of case (“**SoCs**”) for PR24 to the CMA on 25 March 2025. The CMA invited submissions from third parties on the issues raised in those SoCs and any other issues that the CMA should consider as part of its redeterminations.
- (8) To avoid unnecessary duplication, we do not repeat submissions made in the covering letter here. In the additional points set out below, we do not seek to adopt any of the positions in the SoCs of the Disputing Companies, instead we highlight in the following sections those points which we particularly wish to bring to the CMA’s attention.
- (9) Our points fall under four headings:
 - (a) Financeability
 - (b) Quality and Ambition Assessment (“**QAA**”)
 - (c) Ofwat fines and penalties
 - (d) Totex – scope, prioritisation, distinctions between companies
- (10) In the interests of the efficient use of the resources of the CMA and interested parties to the redeterminations, the Investor Group has focussed these submissions on the points of highest priority. These submissions should not be taken as exhaustive of the Investor Group’s views on the

matters raised in relation to the redeterminations. It should not be taken from this that we either support or do not support positions in the SoCs of the Disputing Companies that are not mentioned in these submissions. The Investor Group reserves the right to make further submissions as appropriate in these proceedings.

4. Financeability

- (11) The question of financeability is fundamental to the PR24 settlement and to whether the regulators have complied with the Financing Duty.¹ This is central to the ability of water companies to raise capital and find new investors.
- (12) Regardless of the specific submissions made by each water company, it is vital that the CMA's decision reflects the individual circumstances of that company and adapts the Final Determination ("FD") accordingly. Thames Water's circumstances are unique; so, the CMA will have to properly consider its circumstances, regardless of any decision made with regard to the Disputing Companies, if and when considering a redetermination of Thames Water's FD.
- (13) The CMA should consider carefully Anglian's position, summarised as follows:

*"...there remains a lack of long-term thinking driving price control outcomes, which is undermining resilience; there is a lack of consistency in regulatory approaches which is increasing uncertainty and risk; there remains a lack of sufficient evidence-based decision-making in certain areas; regulation is increasingly complex, reactive and unpredictable ..."*²

- (14) Anglian is right to say that no reasonable investor in a notional company would make the level of investment required over AMP8 and beyond without appropriate recognition of the cost of investment.³ In addition, investment risk is further exacerbated by a significant asymmetric downside skew in returns, a point echoed by Southern, partly due to the framework of PCs and ODIs being skewed towards penalties.⁴ The CMA should have careful regard to Anglian's point that the mitigations built into the FD do not suffice to address the level of risk that the notional company is expected to shoulder.⁵
- (15) We also flag in this respect Southern's comments regarding disproportionate allocation of risk to the water companies, including as follows:

"Ofwat's FD included a series of errors ... These errors taken in aggregate allocate a disproportionate degree of risk to us through the regulatory incentive mechanisms as a result of a series of errors including: (i) insufficient allowances; (ii) punitive outcome delivery incentive (ODI) rates; (iii) an overall skewed package of ODI incentives; (iv)

¹ The Water Industry Act 1991 ("WIA 91"), s.2(2A)(c).

² Anglian SoC para 11.

³ Anglian SoC para 20.

⁴ Anglian SoC para 629(iii); Southern SoC chapter 1 paras 7, 265-268, chapter 6 para 4 (Error 1).

⁵ Anglian SoC para 629(iii).

Performance Commitment (PC) targets that do not reflect company-specific characteristics; (v) insufficient risk mitigations and (iv) an excessively punitive PCD framework.”⁶

(16) The CMA should also consider carefully:

- (a) Anglian’s submission that the PR24 FD WACC ignores the economic circumstances facing the sector and falls significantly below what is necessary to attract investment,⁷ and
- (b) One, though not the only, point regarding debt financeability made by South East - “Ofwat’s conclusion that all companies pass debt financeability tests was dependent on its assertion that companies can raise a collective £12.7 billion of new equity, which was neither evidenced nor credible”.⁸

5. Quality and Ambition Assessment (“QAA”)

(17) The Investor Group is concerned about uncertainty and financial risk arising from potentially large penalties being levied with unclear rationales, exacerbating execution risk from factors that often fall largely outside a company’s control.

(18) The QAA has significant implications for the risk outlook, representing substantial uncertainty and potential financial downside. As a result, it has a direct bearing on financeability and the ability of water companies to raise capital and find new investors.

(19) The CMA should consider carefully various of the submissions made on Ofwat’s QAA framework. In particular, Anglian and Northumbrian highlight its distortive effect:

- (a) “... the price control framework (in particular the QAA[]), incentivises agreement with Ofwat over alternative views to avoid being penalised for lack of ambition or quality in plans”;⁹
- (b) “... the distortive effects of the QAA process disincentivising claims”;¹⁰ and
- (c) “Ofwat’s PR24 framework places strong incentives on companies to submit low base expenditure forecasts, which may be distorting the degree to which companies feel confident in expressing the need for additional funding”.¹¹

⁶ Southern SoC Executive Summary para 9.

⁷ Anglian SoC para 20, Chapter H.2.

⁸ South East SoC para 7.15(a).

⁹ Anglian SoC para 11.

¹⁰ Anglian SoC para 344(i).

¹¹ Northumbrian SoC para 222

- (20) We also wish to bring to the CMA’s attention Northumbrian’s view that Ofwat’s QAA is “*not ... an accurate reflection of [Northumbrian’s] efficiency in practice. Instead, it reflects errors in Ofwat’s approach*”. Northumbrian said that it was “*effectively penalised for not adopting the allowances from Ofwat’s models*”¹², and “*the QAA did not consider companies’ business plan proposals for ongoing efficiency of ‘frontier shift’*”.¹³ These points of view are among those that we consider highly relevant to the CMA’s considerations of the QAA.
- (21) A regulator penalising a company for not agreeing with it undermines the consultative nature of the process and may breach of its public law duties. It may also usurp the company’s statutory rights to redetermination or appeal by obliging it, through threat of penalty, to adopt positions that it does not itself believe to be correct.

6. Ofwat fines, penalties and risk analysis

- (22) The FD exposes water companies to excessive downsides due to Ofwat’s array of fines and penalties. For example, Thames Water is almost guaranteed to incur significant additional penalties over AMP8, regardless of its level of investment. Investors face immediate capital destruction as a result.
- (23) The CMA should consider carefully Anglian’s points about the inconsistency between the need for significant additional capital and the substantially increased risk inherent in the FD’s penalty regime:

*“Ofwat fails to live up to the principles under which regulatory activities should be transparent, consistent, proportionate and targeted. The PR24 FD marks a significant shift from previous AMPs, by endorsing an ambitious large-scale investment programme which will transform the sector. This is, however, entirely inconsistent with the FD’s approach to funding that programme. The FD’s aggressive penalty regime, which materially penalises even ambitious and significant improvements in performance, an overly restrictive PCD regime and associated reporting framework in AMP8, which undermines deliverability, are also at odds with the principle of proportionality.”*¹⁴

- (24) This was echoed by Southern which said:

*“The FD’s ODI package, as well as Ofwat’s overall approach to the PCs and ODIs framework, are skewed towards penalties ... [T]he P50 for a notional company like Southern Water is -0.50% of RoRE, with unrealistic performance expectations, and disproportionately high penalty rates. These do not represent a “fair bet”, or a reasonable incentive on the company to succeed.”*¹⁵

¹² Northumbrian SoC para 129.

¹³ Northumbrian SoC para 222.

¹⁴ Anglian SoC chapter D, Introduction.

¹⁵ Southern SoC chapter 6, para 4 (Error 1).

- (25) In addition, the CMA should take careful note of Anglian’s point that it faces penalties for failing to achieve improvements that it is not funded to achieve:

“At PR24, Anglian is once again expected to achieve unrealistic performance improvements or face excessive penalties, without being funded to do so. As a result, it is exposed to inevitable penalties from the start of AMP8, even if [it] drives significant reductions on its already world-class leakage levels, and even if it delivers a transformative performance in total pollutions.”¹⁶

- (26) The CMA should also look closely at Northumbrian’s comments on Ofwat’s risk analysis (echoed by Southern¹⁷) and at the underlying analysis from KPMG.¹⁸ Among other things, Northumbrian said:

(a) *“... based principally on the limitations highlighted on Ofwat’s RoRE risk analysis, we consider that KPMG’s analysis is superior and much more likely to reflect the outturn performance of AMP8 under Ofwat’s FD24 for the notional company”;* and

(b) *“We note that Ofwat has now set two price controls, at PR14 and PR19, where in a sector blessed with many companies and management teams the average company has failed to live within the cost allowances provided and faced service performance penalties ...”¹⁹*

- (27) As Northumbrian says, in conducting its risk analysis Ofwat errs by consistently taking the mid-point of several statistical ranges for different risk drivers rather than the p50 (median), failing to use the most recent, and more relevant, time period (using AMP6 rather than AMP7 to date) and assuming most of the risks to be normally distributed.²⁰ We agree that this approach leads Ofwat repeatedly to understate the asymmetric risk to the downside faced by the companies under the FD, as demonstrated by KPMG.

- (28) In the FD Ofwat relies²¹ on a report that it commissioned from Grant Thornton. In its report Grant Thornton found extensive problems with Ofwat’s use of a normal distribution to underpin its Monte Carlo risk analysis. While Grant Thornton says that a truncated normal distribution is an improvement over an unadjusted normal distribution it goes no further than that. For example, it not only does not rule out another distribution providing a stronger basis for the risk analysis but plainly says that it found potential inaccuracies in assuming performance is normally distributed across all PCs and that it had not considered an exhaustive set of the approaches available.

- (29) Importantly, and among other things, Grant Thornton in its report for Ofwat said:

¹⁶ Anglian SoC para 7(vi).

¹⁷ Southern SoC Annex 6: Risk and Financeability Appendix 2.

¹⁸ KPMG: PR24 Final Determinations – risk analysis for a notional company, 24 January 2025

¹⁹ Northumbrian SoC paras 399-400

²⁰ Northumbrian SoC para 396

²¹ Ofwat PR24 FD: Delivering outcomes for customers and the environment p51

- (a) *“The approaches considered within this report are not an exhaustive set of all approaches available to Ofwat”;*²²
 - (b) *“Ofwat should continue refining the Monte Carlo simulation to improve its internal consistency and enhancing the calibration process to ensure distributional assumptions are valid and reflective of actual performance”;*²³
 - (c) *“Selecting a distribution and distributional assumptions that closely align with the true nature of the underlying data will result in estimated performance and risk ranges that correspond to the true risk companies may face in the upcoming regulatory period. Conversely, selection of the incorrect distribution and distributional assumptions may produce erroneous results”;*²⁴
 - (d) *“At face value, the results [of Shapiro-Wilk tests] suggest that the broad application of the normality assumption across all PCs may not be suitable. Of the 17 PCs assessed, only 6 had W statistics that suggested normality without residualising while residualising only increased this number to 7”;*²⁵
 - (e) *“Testing for normality revealed potential inaccuracies in assuming performance is normally distributed across all PCs”*²⁶ (emphasis added).
- (30) KPMG established that Ofwat’s risk analysis approach significantly understates the asymmetric risk to the downside facing the companies under the FDs. KPMG said:
- (a) *“This KPMG risk analysis uses the Metalog distribution which captures the observed skew, standard deviation and mean of historical sector performance. Ofwat’s methodology underestimates base-case risk where negative skew is present because normal distributions do not appropriately reflect observed performance in the sector”;*²⁷
 - (b) *“The underlying performance observed in the sector indicates that the likelihood for downside risk outweighs the likelihood of outperformance. Even if each PCL is correctly calibrated, the Monte Carlo simulation results show that the aggregate result is still negative. This means that in a typical year modest outperformance on some ODIs is more than offset by material underperformance on other ODIs”;*²⁸ and

²² Grant Thornton: *A review of Ofwat’s PR24 modelled risk of the Outcomes package*, 5 August 2024, section 3.3, p17

²³ Ibid Executive Summary, p6

²⁴ Ibid section 4.1, p22

²⁵ Ibid section 4.4.3, p25

²⁶ Ibid Executive Summary, p6

²⁷ KPMG: *PR24 Final Determinations – risk analysis for a notional company*, 24 January 2025, section 2, p7

²⁸ Ibid section 2, p8

- (c) *“There is a marked difference in the level of risk exposure across the worst-, base- and best-case scenarios between the results of Ofwat’s and KPMG’s risk analysis. This analysis shows that the outcomes are significantly more negative across all performance categories than is presented in the FDs.”*²⁹

7. Totex – scope, prioritisation, distinctions between companies

- (31) Water companies need achievable, even if somewhat challenging, totex allowances to deliver the unprecedented levels of service required to meet enhanced regulatory requirements and rising customer expectations, in the face of the challenges of climate change, ageing assets and a long period of underinvestment. The FD miscalibrates base costs and enhancement costs, exacerbated by Ofwat’s restrictiveness on how firms spend allowances, extended use of PCDs and greater use of asymmetric performance allowances.
- (32) In this context we highlight that Anglian is not alone in believing itself to be underfunded to deliver the FD, *“severely compromising its ability to manage capital maintenance risks, particularly when combined with the restrictive effects of the ODI and PCD regimes”*.³⁰
- (33) The Investor Group asks that the CMA consider Northumbrian’s points about the FD’s failure to take proper account of the distinctions between companies. There are a range of factors which impact the ways in which a company (among other things) utilises its base allowances. We are of the view that a company’s operational region is one such factor with Thames Water’s London footprint being particularly influential in determining real costs. As one example in this context we urge the CMA to consider carefully Northumbrian’s points regarding the setting of its totex allowances, including:
- (a) *“Ofwat’s estimation of a simple average of renewal rates across all companies does not take proper account of the differences between companies and the factors that may have influenced their choices about how to use base allowances in previous periods”*;³¹ and
- (b) *“We welcome Ofwat’s recognition that its base cost allowances are insufficient to fund a long-term sustainable rate of mains renewals and that there is a need for the level of renewal activity to increase in AMP8 ... However, that step up in activity must be adequately funded, and ... Ofwat’s FD24 base cost adjustment is insufficient to fund this level of mains renewal activity”*.³²

²⁹ Ibid section 6.1, p28

³⁰ Anglian SoC para 37.

³¹ Northumbrian SoC para 340.

³² Northumbrian SoC paras 357-358.

*“The difficulty lies not so much in developing new ideas as in escaping from old ones.”
(Keynes, *The General Theory of Employment, Interest and Money*)*

1. Summary

- (1) The CMA faces a daunting task. It is redetermining multiple water company price/revenue controls in an environment of increased uncertainty, complexity and systemic challenges, seeking to ensure a regulatory system that serves the long-term interests of consumers, including by attracting the enhanced investment that is judged necessary to do that. (Section 2).
- (2) The determinations as they stand underestimate the economic uncertainties and challenges the companies face. The methods Ofwat has used to estimate the costs of investment finance are insufficient, not least because company-specific uncertainties are substantial. A more comprehensive review of these matters is warranted, to take account of contextually relevant ‘missing factors/variables’. (Sections 3-5).
- (3) There are questions to be asked about Ofwat’s use of econometric models, in particular the inconsistent treatment of economies of density. The exclusion of a squared density term in wastewater risks introducing systemic bias into the cost assessment, which may be particularly significant for companies with atypically small or large network densities. (Sections 6-7).
- (4) The efficiency frontier also warrants re-examination. The introduction of a factor designed to reflect efficiency improvements over and above the actually assessed future costs lacks evidential foundation. It rests on optimistic assumptions about cost reductions that, in current conditions, may very well not materialise. There is little recognition of the costs incurred in the changes in business structures and working practices normally incurred in achieving productivity improvements. (Section 8).
- (5) The incentive framework has become overly complex. Its impact on the companies’ conduct and outcomes is poorly understood, and there is insufficient evidence to justify the current scale and structure of the financial penalties. For some of these incentives, particularly time-related price control deliverables (PCDs), the potential for unintended, negative consequences is high. (Section 9).
- (6) The reliance on the Capital Asset Pricing Model (CAPM) in times of uncertainty and the possibility of recourse to the Special Administration Regime (SAR) are matters that should be considered in the CMA’s review. The implications for consumers, investors, and potentially the public finances, are significant (Section 10-11).
- (7) I conclude with a few suggestions for potentially improving the existing determinations:
 - Incorporate broader measures of uncertainty when assessing the cost of capital.
 - Ensure all density-driven cost models include squared terms to reflect the non-linear cost relationships.
 - Reassess the scope and structure of the incentives regime, considering alternatives such as non-financial reporting incentives.
 - Reconsider and significantly discount the frontier shift, given the current uncertainties.
 - Conduct an investability check to verify whether the determinations are financially sustainable in the current market conditions.
 - Assess the role and implications of the SAR. (Section 12)

2. Overview of the CMA challenge

- (8) To state that the CMA Panel faces a formidable challenge is, perhaps, an understatement.
- (9) There are five re-determinations to be made, with a sixth possibly in prospect, each for an undertaking with its own, unique network topology. Partly in consequence of that, a wide range of issues are in dispute. Those features of the context will alone generate a heavy flow of documentation to be sifted and examined.
- (10) The network topologies are complex, and so too have been the regulatory responses. I think it is fair to say that Ofwat has sought to micro-manage the relevant businesses to an extent that surpasses other comparable sector regulators, manifested for example in the scope of the outcome delivery incentives (“ODIs”) and PCDs. These necessarily interact with one another, and with the overall price/revenue determination, in what can only be properly analysed as a *system of regulation*. The result is to add complexity to complexity.
- (11) Looking at the state of play from a wide-angle, historical perspective, it brings to mind both Alexis de Tocqueville and Adam Smith. The former because of his use of the expression “a network of small complicated rules” which, in the political sphere, he argued was likely to degrade into what he called ‘soft despotism’. Smith, because there has clearly been a breakdown in the originally intended ‘division of labour’ between managers, regulators and government, and he regarded the division of labour as of central importance in determining productivity levels and productivity growth, and hence the long-term welfare of citizens as consumers (with which he was chiefly concerned) – see the very first sentence of the *Wealth of Nations*.
- (12) Looking at things narrowly, there are unprecedented, business-specific issues to be considered, particularly given that the redetermination process requires the CMA to ‘put itself in the shoes of Ofwat’. The most obvious is the existential threat posed to Thames Water in its current shape/form. Will this end with the first usage of the as-yet untested Special Administration Regime (SAR) and, if it does, what will be the consequences of that, e.g. for consumers, investors, environmental improvement, and macro fiscal policy?
- (13) Looking at the landscape with a more mid-angle perspective, there is a rapidly changing economic and political context to consider. The determination calls for something like a tripling or quadrupling of capital expenditures over the next five years against a background characterised by an extended hangover of Covid-era effects – e.g. on the supply of labour – and a large uptick in infrastructure investment requirements in other economic sectors, heavily (though by no means exclusively) driven by de-carbonisation and other, more local environmental policies. Thus, the water sector will necessarily have to compete with other economic sectors for both capital and skilled labour in a likely context of supply constraints, with rationing of resources by either price or delay.
- (14) As lawyers might say, what we have recently witnessed, and what we can reasonably continue to expect to witness over the next five years and beyond, are ‘material changes in circumstances’. For regulators and for those with power of influence over regulatory structures, this calls for adaptation to the changing economic, social and political environments in which they function, and adaptation raises challenges of its own. While there are many potential ways of responding to changing contexts/circumstances, there tend to be many fewer ways of adapting which promote better (rather than worse) outcomes. There is a sorting exercise to do.
- (15) My instructions ask me to consider some of the areas of economic reasoning that may be of particular salience to the development of the CMA’s thinking and research on the redetermination issues. Those I have chosen are set out below. The relevance of each, considered singly, may be of greater or lesser significance to a particular re-determination, but

that is a matter for the Panel to consider on the basis of what is likely to be a mass of more specific materials in the pipeline. That sort of exercise is well beyond the scope of this relatively short paper.

- (16) The list comprises:
- Uncertainty: its meaning and implications.
 - Complexity and ‘wicked’ problems.
 - Investability: its meaning and the questions it raises.
 - Economies and diseconomies of density.
 - Questions of statistical methodology.
 - The efficiency frontier and the costs of change.
 - Incentive regulation and its limitations.
 - Use and misuse of the Capital Asset Pricing Model (“CAPM”).
 - The Special Administration Regime. .
 - Ways forward?
- (17) Each section is short (though some are shorter than others), the aim being simply to examine economic research on a particular topic that might be salient to the Panel’s challenges, with occasional pointers to some of the linkages to a prospective Thames Water re-determination, which, if it comes to the CMA, is likely to be the most consequential of the set. While Thames Water’s ongoing discussion with its regulator has deferred specific consideration of its situation, the points I make are relevant also to the sector and its challenges as a whole.
- (18) The final section indicates a few possible ways forward which might be inferred from parts of the preceding material. These are not intended to be read as worked-out options or recommendations.
- (19) The paper is supplemented by two short annexes that encompass evidence from contexts that differ radically from the specific contexts the Panel is required to address, but which I have judged might be sources of insights relevant to the issues raised in the paper itself.

3. Uncertainty

- (20) The view that ‘regulatory uncertainty is negative for investment’ is to be found in documents generated in regulatory policy development processes in many jurisdictions round the world, including documents produced by regulators. It is a very widely held view (including by me) and, for example, it is reflected, in past Ofwat comments on the importance of stability and predictability in the regulatory regime for encouraging investment.
- (21) However, it is usually to be found that, in these documents, the concept of uncertainty is itself ill-defined. In particular, it is often conflated with risk, which is concerned with assessments for which the probabilities of future events can be quantified to at least some degree of accuracy. Uncertainty, on the other hand, is Dylanesque: it points to ‘complete unknowns’.
- (22) Uncertainty and its implications were major pre-occupations of doyens of two of the leading schools of economics in the 20th century, Frank Knight (Chicago) and John Maynard Keynes (Cambridge), to whom can be added Friedrich Hayek (Austrian), although Hayek’s approach to the matter was less direct. Notwithstanding many differences on points of economics among these thinkers, there is much common ground when it comes to uncertainty. And, to add a personal note, I was taught as an undergraduate that this common ground was not shared with much of the later development of economics. The ‘Keynesian models in the textbooks of the 1960s were not to be confused with the economics of Keynes’, said lecturers who were familiar with the latter, by dint of their participation in the development of *The General Theory*. The

uncertain elephant that lurked in the hall that is the *General Theory* had been led outside, to concentrate on more manageable analytics.

- (23) How, it might be asked, does any of this bear on the water re-determinations? To answer the question, consider a situation in which the starting point is a probabilistic assessment of possible future outcomes which is made at time t , based on available information at time t . Now roll forward to the following period, say a year later. Events will have occurred and stuff will have happened by then. New information will have been *discovered*, which will affect any later, forward-looking assessments.
- (24) There are two, key points to note:
- The *changes* in assessed probabilities between t and $t+1$ are ‘complete unknowns’: they will depend on information that is not yet available, on information that is yet to be *discovered* in the relevant time interval.
 - There are reasonable grounds to believe, at time t , that stuff will keep happening and hence that assessment probabilities will be adjusted, albeit in unknown ways. Mr Rumsfeld might have labelled this a known unknown.
- (25) It is, then, the *changes* in assessed probabilities or assessed likelihoods over time that are the locus of uncertainty, and a clear identification of its nature opens up opportunities to start to get some sort of grip on how to handle its presence. We can, for example, look back for evidence of past indicators of changes in probabilities and their correlates to get a sense of higher and lower levels of uncertainty. Such exercises are very far from precise, but weak information signals are better than no information signals.
- (26) Thus, for example, it can be said that uncertainties will tend to be higher when there is a sense that ‘the times are a-changing’. Old probabilistic assessments are proving to be wrong: they are being falsified by major events. The future looks as if it is going to be significantly different from the past.
- (27) If dealing with uncertainty is likened to picking a route through a dense fog on a flat plain, then knowing from past experience that the fog density at any place is likely to vary in intensity over time is known, valuable information. It suggests a value in waiting for a less dense period before hurrying off in a particular direction, to, say, reduce the likelihood of walking into a bog.
- (28) In the case of regulatory decisions, the equivalent of the meteorological forecast might be an assessment of the capacity of a regulatory system to produce ‘surprises’. In turbulent times that raise unprecedented issues, getting a handle on what the regulator might decide will tend to be more difficult than in more settled times. Hence, more and larger surprises might be anticipated, even in the absence of knowledge of what those surprises might be.
- (29) Committing funds to an investment typically forecloses (economically valuable) options that would otherwise be available, if the investor had retained more liquidity. Liquidity allows for adjustments in the disposition of funds as the assessment probabilities change over time. This is, in effect, the basis of Keynesian theory of liquidity preference. In periods of high uncertainty, borrowers will have to pay more to lenders for surrender of liquidity. The ‘liquidity trap’ is just an extreme version of a more general argument: higher uncertainty tends to raise the cost of capital.
- (30) It might be noted at this point that an assessment to the effect that uncertainty is likely to be elevated in an upcoming period is equivalent to saying that the period is expected to be one of potentially higher learning/discovery. And it is on account of this – dynamically changing information – that it is possible to say that competitive markets enjoy their greatest advantage

over alternative methods of allocation of resources when uncertainty is elevated, competition being a particularly effective discovery process.

- (31) Putting things in this second way may help to alleviate the concern that uncertainty is completely unquantifiable. Thinking of the possibilities for learning makes it easier to see that there are likely to be some bounds that can be put, at least in a very rough and ready way, on the potential for surprises. For examples of attempts to ‘quantify uncertainty’, enter “US policy uncertainty index” into a search engine. It may not be done well, but it can still usefully be done.
- (32) Irrespective of the quantification issues, it will remain the case that uncertainty will affect the cost of funds: it is a factor that needs to be considered.

4. Complexity

- (33) The Master Economist “... *must contemplate the particular in terms of the general* ...” wrote Keynes in a short biography of his mentor, Alfred Marshall. It is good advice: over-focus of attention on a narrow particular whilst under-attending to its wider context/environment is not advisable for individuals or organisations.
- (34) The outstanding illustration of the point in modern times comes from the financial crash of 2008. In response to a question of the Queen – did nobody see it coming? – a number of Fellows of the British Academy wrote a letter to Her Majesty in an attempt to explain what they thought had happened. Inter alia, they said: “*One of our major banks, now mainly in public ownership, reputedly had 4000 risk managers. But the difficulty was seeing the risk to the system as a whole rather than to any specific financial instrument or loan. Risk calculations were most often confined to slices of financial activity, using some of the best mathematical minds in our country and abroad. But they frequently lost sight of the bigger picture.*” The ‘Masters of the Universe’ were seemingly not ‘Master Economists’.
- (35) Contemplating ‘the general’ necessarily requires engagement with complexity, which is a prime source of what have been called ‘wicked’ problems, i.e. problems to which there is no realistic prospect of responding with what ordinarily might be classified as ‘solutions’. Perturbations of a complex, evolving economic system resulting from changes in laws and regulations, even when they are small in scale and intended scope, tend to have diffusive effects on the functioning of the whole system which are impossible to track in detail.
- (36) When longer-term investors and ratings agencies assess information for decision-making purposes, they tend to take a wide-angle look at ‘the general’, which includes assessment of the structure of the relevant regulatory sub-system and of the conduct of regulators. What they are particularly interested in in this (the regulatory part of the wider picture) are the *effects* these things have on rates of return. While that can be classified as a ‘narrow’ interest, it is one that can only successfully be pursued by taking a broad view of a much wider ecology/system. And the events of 2008 indicate that they don’t always get it right: the complexities defeat them.
- (37) Something similar can be said of business managements at the sharp end of regulation. The pursuit of a ‘narrow’ interest is there, and so is the necessity of a more general assessment. Inter alia, they need to figure out what their own incentives look like and what they imply for what they should do to best pursue their own interests. And that turns out to be quite a challenge. Business incentives are co-determined by a whole system of regulations, not just by a single regulation or rule. Functions that map the system of rules and regulations into a particular business-level incentive structure are, in mathematical terms, ‘non-separable’. For practical purposes, that means that effects cannot be evaluated by breaking the relevant, component parts of a regulatory system down into individual regulations or small sets of

regulations, analysing the effects of each an isolation, then adding the results of the effects together.

- (38) The introduction of any particular regulation tends to affect the effectiveness of other regulations in the system, often in a negative way that can be reasonably referred to as *regulatory interference*. When the system of regulations is itself complex, these cross-effects are difficult to assess, and hence they induce uncertainty about the overall impact of the system on the end regulatee. The existence and nature of cross-effects can, however, be illustrated by a few simple examples.
- A former Deputy Chair of the then Monopolies and Mergers Commission once remarked (in a discussion): ‘It’s a funny thing. Whenever we find that there is some restriction of competition, more often than not there is some or other government regulation behind it.’ Regulations concerned with such things as environmental impacts and health and safety issues, can impede the effectiveness of competition authorities in achieving their own objectives. That’s serious, because promoting and sustaining competition is an across-the-economy policy, so impairment of its effectiveness can be said to be systemic in nature.
 - In a Regulatory Policy Institute study conducted about 20 years ago on the burdens of regulation on small businesses, commissioned by the Cabinet Office, an interviewee, in a free flowing discussion lasting 2 hours, told us: ‘I would love to comply, but the fact is that I simply don’t know what compliance entails.’ The person concerned had a doctorate in engineering, so was not lacking in analytical skills, but the complexity of regulation defeated him and he was highly uncertain about how to proceed in the management of his business.
 - From another socio-political universe, we have, from a much-cited paper in experimental economics on children’s day-care centres in Haifa, Israel. A fine was introduced on parents for late pickups. It was expected that this would induce a reduction in parents’ lateness: but it did the opposite, lateness increased. What was conceived as a fine that would deter lateness could, from a parents’ perspective, be seen as a payment for incremental day-care services. The fatal, implicit assumption was that there were no cross-effects among the individual components of a regulatory system, when there almost always are. Put another way, ‘the particular was not considered in terms of the general’. Because the study comes with some rather fundamental general lessons, a short discussion of it is contained in Annex 1.

5. Investability

- (39) Investability is a relatively recent addition to the regulatory lexicon, and it appears not yet to be included in the Investopedia dictionary. In the absence of a well-established meaning, Oxera attempted a definition in their 2024 Report for Water UK: “For a price control to be ‘investable’, it must be highly likely that the company can attract and retain the equity capital needed to deliver desired investment.”
- (40) The restriction to equity capital is, I think, too restrictive for general, definitional purposes: in principle, desired investment can be financed by debt as well as equity. It is the attraction and retention of finance in its totality that matters.
- (41) With this qualification, the investability criterion can, I think, be viewed as a consistency test. The price review determination is built up, in a familiar and traditional way, from assessments of costs, including a cost of capital. As will be discussed later, the cost of capital estimates are based on a large number of untested assumptions, some of which are wildly at variance with observed realities.¹ It’s not practically feasible to test all the assumptions one by one – there

¹ Highly consequential, contra-factual assumptions include: a single-period investment horizon; no transaction costs; the existence of a risk-free rate; and homogenous expectations (all investors think alike, on the basis of

are just too many – but what can be more easily tested is the financial feasibility of the determinations, considered holistically, as a system of regulations.

- (42) It is a matter of comparing a demand for finance implied by the determinations with the supply of finance likely to be forthcoming in light of those same determinations. If the supply of finance doesn't meet the demand, the *prospectus* set out in the *determinations* is not investable.
- (43) Note that this cuts through some of the awkward questions that can arise in the interpretation of the financeability duties imposed on sectoral regulators, like: What precisely are the functions whose performance is to be sustained? Are they restricted to operations as they are, or should they include some expanded activities? What if costs are judged to be inefficiently high? Should the business be allowed revenues that will support the financing of those costs?
- (44) The determinations are what they are. However derived, the totex allowances are as they are in the determinations, alongside the activities they are expected to fund. Cost efficiency assessments have (or should have) been done already in the building up of the estimates. The implied demand for finance is Ofwat-determined, via its decisions.
- (45) The terms on which finance is available are determined in capital markets: the regulator has no control over that part of the matter. So, if there is evidence that the prospectus offered in the determinations is not investable, the obvious inference is that either the determination must be mis-calibrated, or that the regulator is content to see a protracted period of under-finance.
- (46) The conclusion is independent of the precise nature of the sources of the mis-calibration. It doesn't matter whether it is underestimation of totex, underestimation of the cost of capital (e.g. by failing to recognise the implications of uncertainty for investment), over-aggressive assumptions about shifts in the efficiency frontier, or the complexities of the ODIs and PCDs. These are things the Panel will likely want to delve into, but testing investability is (or should be) a prior exercise, an early reality-check on the determination as a whole.

6. Economies and diseconomies of density

- (47) The concepts of economies and diseconomies of density play a very large role in the analysis of network industries such as water, energy (transmission and distribution), telecoms, transport (air, road, rail and sea), and the like.
- (48) In mathematical terms, a network is a structure defined by nodes and the connections between nodes. A node may be little more than a junction of two connectors, as when one railway line branches off from another, but the more important nodes may be characterised by the presence of significant physical infrastructure (a reservoir, a water treatment plant, a rail station, an airport, a power station, a gas compressor or storage facility, and so on).
- (49) For physical networks, spatial factors are of central importance: location matters. Professor Sam Peltzman (University of Chicago) has put it this way:

“Most important, I believe, is that however they are organized, these industries would sell, in the absence of state intervention, essentially similar services at vastly different prices to differently situated customers. For example, the small, isolated customer

the same information!). The latter is a personal *bête noire*: in capital markets, investors compete to *discover* more economically valuable information in their search for higher returns. At bottom, the assumptions abstract from the existence of market competition, by assuming conditions in which competition has no role to play.

would pay substantially more for electricity, gas, and telephone [Peltzman was speaking in 1987] than the large buyer in a dense market”.²

(50) In the water sector, each water company’s infrastructure is characterised by a unique network topology. The structures reflect the spatial patterns of the demands for water and wastewater services in each area. These in turn reflect geographic settlement patterns (egs. scattered local communities, smaller towns, larger towns and cities, and major metropolitan areas). Nodes and connectors of the physical network correlate with population densities. ‘Costs to serve’ any individual customer can vary considerably within a company’s area and, when aggregated to company level, significant differences in costs between areas/companies are to be expected – because of the differences in network topologies.

(51) In building up cost estimations for a company area, because of the spatial variations it is desirable to work with a relatively high level of granularity, *before* aggregating to company level. However, it is not to be expected that prices will, or even should, be cost-reflective at the granular level. As Peltzman put it:

“The pervasive tendency of state intervention has been to suppress these [spatial price] differences, usually by creating monopoly rents which are partially dissipated either in cross-subsidies or via explicit subsidies to the high-cost customers.”³

(52) It needs only to be added that this political tendency is to be found on a world-wide basis and can safely be taken as fact.

(53) So, a good deal of aggregation and averaging is almost inevitable for practical regulatory purposes. Ofwat has proceeded in this task by calculating an averaged density metric for each company, built up from customer densities in smaller geographical areas within its region of coverage. In the context of PR24, I understand that there is some controversy about the way that this exercise has been done, but I am not sufficiently across the detail to say anything useful to the CMA on the matter, nor, and perhaps more importantly, on whether the cost build up starts at an appropriately granular, geographic level.

(54) Instead, I will focus on what is done with the area density metrics, once calculated. And on this point I think Ofwat has fallen into serious error in its modelling of density effects.

(55) Let me start with some, general propositions that I think can be inferred about relationships between average costs and density in network industries, based on both past experience and relevant economic literature:

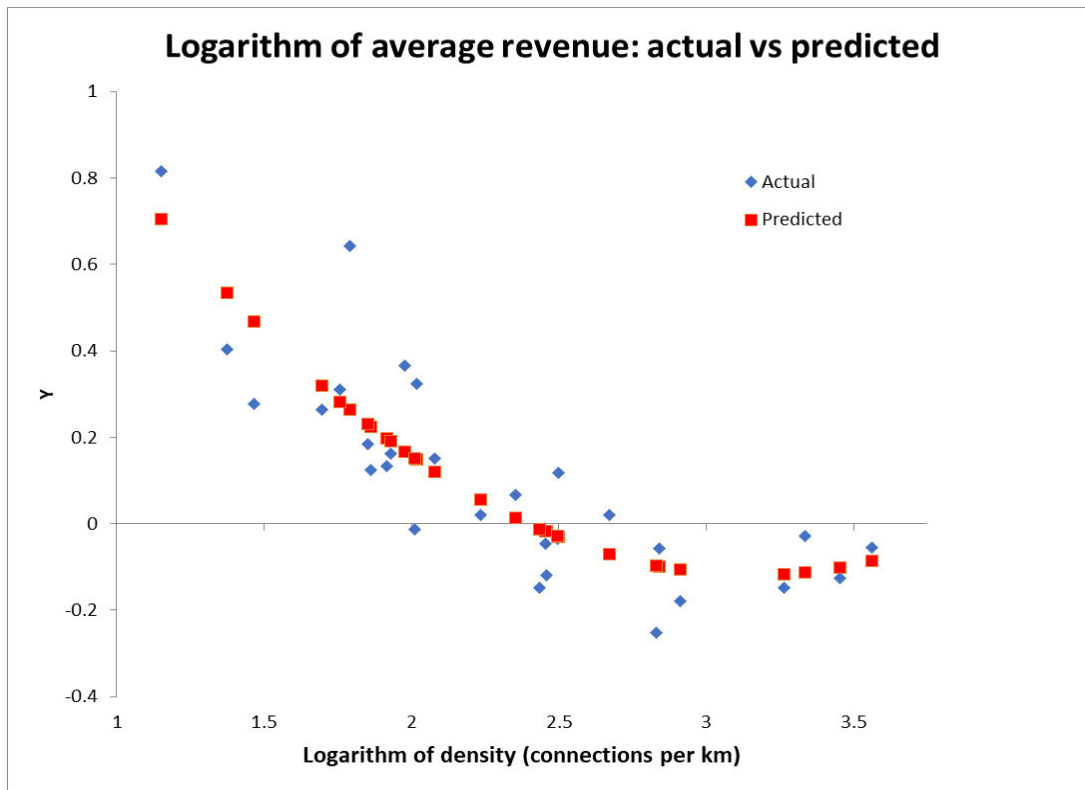
- 1) There tend to be large economies of density in areas where density is very low.
- 2) Economies of density tend to become significantly lower at relatively modest density levels. (This can be surprising at first encounter, but may become less so after familiarisation with the facts that there were over 1,000 water undertakings in England and Wales in the early 20th century and that there are over 800 local electricity distribution undertakings operating in Germany today. It’s a case of ‘natural monopolies galore’, each operating at a relatively localised level.)
- 3) The relationship then tends to become relatively flat.

² Sam Peltzman, in P. MacAvoy, W. Stanbury, R. Zeckhauser and G. Yarrow (eds.), *Privatization and State-Owned Enterprises*. Rochester Studies in Managerial Economics and Policy, Kluwer Academic Press, 1989.

³ It may be relevant to note at this point that this general statement applies also in circumstances where there are diseconomies of density. In this case customers in very high density areas might, depending on the empirics, become the beneficiaries of cross-subsidies funded by customers in not-so-dense locations.

- 4) Finally, at very high levels of density the relationship tends to turn upwards: economies of density become diseconomies of density. The usual explanations of this include what I refer to as infrastructure ‘clutter’ (which makes for more difficult working conditions) and higher input costs (of labour, land, etc) in major cities.
- (56) In respect of the last of these intervals of density, PR24 itself provides a non-exhaustive list of the potential factors at work⁴:
- “... companies operating in densely populated areas may bear higher property, rental, labour, and access costs. They also face a more complex operating environment, which may lead to higher costs:*
- congestion of underground assets complicates access;*
 - higher electricity requirement to pump water to taller buildings;*
 - traffic which affects ground movement, increasing the frequency of repairs; and*
 - longer travel times due to congestion.”*
- (57) Taken together, the above four propositions imply a U-shaped average cost curve (for costs vs density), and this gives rise to a number of questions, including about how to calibrate the relevant non-linearity of the curve and the potential consequences of getting the calibration wrong. The latter (consequences of error) is the more difficult issue and, in my judgment, by not asking itself the relevant questions and/or by not providing convincing answers, Ofwat has mis-directed itself in the determinations.
- (58) To explain the basis of this strong judgment, I will draw on some work I did, back in 2018, on density issues in electricity distribution in New Zealand. The public policy context of that work is set out very briefly in Annex 2. It’s a far away country and a different network sector, but it nevertheless serves to illuminate matters that are highly relevant to the CMA’s re-determinations. It also has the merit of being heavy on observational facts and light on speculation.
- (59) The Chart below shows a plot of average revenue as a function of density for the 28 electricity distribution undertakings in New Zealand. The observations are represented as blue diamonds.

⁴ At page 25 of <https://www.ofwat.gov.uk/wp-content/uploads/2024/12/PR24-final-determinations-Expenditure-allowances-Base-cost-modelling-decision-appendix.pdf>



- (60) Electricity distribution is a sector regulated by the NZ Commerce Commission, at varying degrees of intensity according to the size of the undertaking – an application of the proportionality principle. The size range of the undertakings is large, from close to 5,000 customer connections to 623,000 connections, i.e. the largest undertaking is, on this measure of size, around 125 times larger than the smallest. In these circumstances, average costs and average revenues are very strongly correlated across the sample, so the latter was used as a proxy for the former to economise on data collection.
- (61) The basic measure of averaged, per-area density is the ratio of the number of connections to total line-length. The logarithm of this ratio can be thought of simply as ‘density’, as measured on the basis of a logarithmic scale, like the Richter scale for earth movements, the decibel scale for sound, and entropy in thermodynamics.
- (62) An eyeball test focusing on the observations (the blue diamonds) is sufficient to reveal that the best representation of the data will not be linear (a straight line): there is a distinct pattern that indicates that a variable that provides for curvature is needed in a fitted equation. Given what is to follow, it is worth stressing that this is a relatively hard and fast conclusion from direct observation of the displayed data. There are no significant ifs and buts.
- (63) Using the simplest way of introducing curvature into the picture, the line fitted added a quadratic term, the square of the density metric. The fitted/predicted values of the augmented equation are shown by the orange boxes. It is clearly a better representation of the data than would have been the case in the absence of the quadratic term.
- (64) This is all very much in keeping with what I understand to be the approach taken by Ofwat economists/econometricians. So far, so good; but now for the problems.
- (65) The econometric work that Ofwat relies on includes the quadratic term in the modelling of the water supply parts of the networks, but not in the modelling of the wastewater parts, yet the

relevant U-shape is found to be exhibited by the data analysed in both cases. Whichever way it is looked at, this amounts to cancellation of relevant evidence in the assessment – and it is potentially highly relevant evidence, because of the known importance of density as a cost-driver in this type of network sector.

- (66) The justification that is given by Ofwat for the wastewater decision is that “*We only include explanatory variables in our base cost models that are underpinned by strong engineering and economic rationale. There is not a strong engineering rationale for including a quadratic population density term in our SWC base cost models.*”⁵ But given the strong economic rationale, why cancel consideration of the quadratic term because the engineering rationale is judged not ‘strong enough’ to warrant its inclusion? What criteria are used in determining what is and is not ‘strong enough’? Was the strength of the engineering evidence sufficient, by and of itself, to rule out any possibility of a U-shaped relationship, irrespective of the strength of other evidence on the point? I am sceptical.
- (67) Engineering-based estimates are certainly important in the estimation of cost functions for regulatory purposes, but they are just one approach among several and they have limitations of their own. They depend, for example, on assumptions about input prices, which are determined in practice by supply and demand in markets, and they tend to abstract from social, legal, organisational (project management challenges) and political (local as well as national) factors that can affect costs. In reality they are modelled hypotheticals, not data, particularly in an economic situation in which thickets of regulations and of opposition are known to stand in the way of building and engineering work.
- (68) When different approaches do not produce aligned answers, there is a judgment call to be made, preferably after an attempt to understand the causes of the divergence. For example it could be asked: Do the engineering estimates take full account of the exemplary factors identified in PR24 which might lead to diseconomies of density (as cited above): higher property, rental, labour, and access costs; a more complex operating environment, potentially featuring congestion of underground assets; higher electricity requirement to pump water to taller buildings; traffic which affects ground movement, and longer travel times due to congestion? Also: are the engineering estimates built up from reasonably spatially-granular starting points, which adequately reflect the variability of density within a company’s area of coverage?
- (69) In making the judgment call, it seems to me to be manifestly irrational to give all the weight to one set of results from a particular estimation method and give no weight at all to other, alternative methods, at least without further, careful investigation, including investigation of the consequences of errors in judgement. As I once taught to Engineering, Economics and Management students, engineers necessarily work in a socio-economic environment and the physical and social science aspects of their chosen course combined well for many practical purposes. They were not to be thought of as separate silos.
- (70) Not only would the absence of the quadratic term in the wastewater equations have led to a poorer representation of the recorded data, it would likely have introduced a systematic bias into the estimation of the effects of density on costs. More specifically, the fitted equation would tend to underestimate the effects of density on cost for the least dense areas, overestimate those effects for undertakings in the middle range of density, and underestimate the effects for undertakings with the highest densities. And that is a serious matter for a regulator tasked with setting expenditure allowances for a whole set of companies with networks characterised by both intra- and inter-regional variations in density.
- (71) Returning to the NZ Chart and the U-shaped relationship that the data indicate, there is an obvious second, policy relevant question that might be asked: If this is an average cost curve

⁵ Ibid, Table 9.

(subject to a logarithmic transformation), what does the corresponding marginal/incremental cost curve look like? In this case the answer is easy. It is a straight line with a positive slope which passes through the minimum of the average cost metric. To the left of the intersection point (in the range where there are economies of density), incremental costs of density are lower than average costs; to the right of the intersection point (in the range of diseconomies of density), incremental costs are above average costs.

- (72) If the quadratic term is dropped, the estimated marginal/incremental cost would just be a constant, the same at all levels of density. If represented on the diagram, it would be a flat line.
- (73) Needless to say, these are two rather different views of the world, with rather different implications for regulatory decisions, particularly in a context of decisions about a set of undertakings with varying densities, and particularly when densities are changing over time. If, say, densities are generally increasing, the implications of a U-shaped relationship are that lower-density areas will enjoy *decreasing* average costs whilst, at the same time, very high-density areas are experiencing *increasing* average costs.
- (74) The conclusion must, I think, be that, if density really matters, *the quadratic term (or some other variable capturing the relevant curvature) matters too*. It should be there in the econometric estimation of wastewater costs as well as of water costs. What may have looked like a geekish question to be answered on the basis of a narrowed econometrics could in fact have had very material bearings on the determinations and their likely consequences.

7. Questions of statistical methodology

- (75) In the use of statistical/econometric methods in regulatory exercises concerning price/revenue determination, the primary aim should be to seek the best plausible account or ‘re-presentation’ of the data, as an input to higher level decision-making. A secondary aim should be to provide, where possible, a sense of the degree of confidence in that ‘best account’, relative to alternative accounts. The statistical methodology adopted by Ofwat in PR24, and in previous determinations, does not do this on a consistent basis: it tends to focus first on the *testing of individual hypotheses*, not on best plausible accounts of the data.
- (76) Inconsistency is not an Ofwat-specific issue, although the complexity of the system of water regulation that has developed arguably makes it a more transparent problem than is the case in other sectors. The inconsistency stems from a lack of integration between analysis of the ‘particular’ (a narrowly focused examination of an issue) and the ‘general’ (the wider context and purpose of the price/revenue determination as a whole). At root, it is an organisational problem, to do with the division of labour in regulatory organisations, and with the overall co-ordination (or lack thereof) of the different exercises that are undertaken by the organisation.
- (77) To illustrate, and sticking with density issues (because of their systemic importance), consider this statement on metering made in the PR24 documentation⁶:

“Model specification. We have retested meter penetration and population density in the models. Population density is statistically significant with new meter installations, but not statistically significant with meter upgrades. We incorporate the population density variable into the new meters model. Meter penetration is not statistically significant, and so we do not incorporate this variable into the models.”

- (78) What this is saying is that, if an explanatory factor cannot be demonstrated to a high and arbitrarily determined degree of confidence – 60%, 70%, 90%. 95%. 97.5%? – to be relevant, it will be taken to be completely irrelevant and will not be considered further. But there is

⁶ <https://www.ofwat.gov.uk/publication/pr24-final-determinations-expenditure-allowances/> , page 200.

obviously a large gap here between a high confidence that a factor is a relevant driver of costs and a view that it is irrelevant and further consideration of it is not necessary. Within the gap there lies a wide range of possibilities for a variable to carry valuable information content. The consequence of ignoring this content is information loss in the passage of work done from one unit in an organisation (examining the econometrics) to other parts of the organisation.

- (79) In fact, the PR24 documentation recognises this problem in principle.⁷ In particular, it recognises in Table 9 that significance tests may be failed because of data problems, e.g. measurement errors, and collinearity, to which can be added small sample size. All these factors are at work in the current context.
- (80) The aggregation of observations required to obtain a density metric for a particular company necessarily means that the resulting measurement is a rough and ready thing, likely to be subject to substantial errors. This makes picking out the signal from the noise more difficult, and tends to imply not only lower levels of confidence in estimates, but also attenuation bias in the point estimates themselves.
- (81) There is also obviously collinearity in the density and squared density variables, and the sample size is ‘informationally small’. The number of cross-sectional observations is limited, and the addition of time series observations adds little in the way of information, even though it greatly expands the number of data points.
- (82) Interestingly, in its first box, Table 9 states that Ofwat gives high weight to prior expectations. This introduces a Bayesian element into the thinking which, as a lifelong Bayesian, I can only applaud. The problem is that the regulator doesn’t carry this through into practice in the actual determinations.
- (83) Thus, with reference to the citation above about new meter installations and meter upgrades, the criterion for including or excluding a density variable is the level of significance of the relevant coefficient in a fitted equation. Yet, given the ubiquity of density effects, there is good reason to hold a prior expectation that density will matter. Why, then, not include it, and squared density, in all fitted relationships, which would be easy enough to do?
- (84) There is, therefore, another gap here, between the theory/principles set out in Table 9 and actual practice. It all seems a bit of a muddle.

8. The efficiency frontier and the costs of change

- (85) The notion of introducing a factor designed to reflect expected efficiency improvements of regulated businesses is, perhaps, a distant descendent of the X-factor introduced in the UK at the time of the early privatisations of sectoral monopolies. “RPI - X” then became a sort of UK brand that attracted interest from around the world. It therefore had some soft-power value in which domestic political and regulatory systems became intellectually ‘invested’, i.e. one of those ideas which may be difficult to shift (see the Keynes citation at the top of this paper).
- (86) It is to be remembered, though, that the context then was rather different from the context now. The starting price levels were those established at the end of the lives of the businesses as public corporations and therefore subject to all the vagaries to be expected from the influence of vote-seeking politicians. There were significant adjustments of prices to be done to move them toward more cost-reflective levels. Some of these adjustments were downward, some were upward, electricity distribution and water sector charges being cases of the latter.

⁷ <https://www.ofwat.gov.uk/wp-content/uploads/2024/12/PR24-final-determinations-Expenditure-allowances-Base-cost-modelling-decision-appendix.pdf>, Table 9.

- (87) There was little information at the time as to what reasonably efficient costs would look like. The idea was that, by pre-determining allowed, maximum prices for a regulatory period of several years, regulatees would have incentives to work to reduce costs, giving rise to a process of *cost-discovery*. What was discovered in one regulatory period could then be used to inform price/revenue determinations in the subsequent regulatory period. To a degree at least, the temporal pattern mimicked the dynamic adjustment process of discovery in competitive markets: temporary super-normal profits from successful discovery, followed by their later erosion.
- (88) Now, however, the context is rather different. There has been a sequence of price reviews and a long period of cost-discovery, so regulators can use the information they have to build up an overall assessment of costs from detailed evaluations of the various activities performed – what has come to be called the ‘building block’ approach. And this raises an immediate question: What now is the rationale for an “E factor” in the built-up cost/expenditure assessment?
- (89) The answer given by Ofwat is that it is to adjust for expected productivity growth over the relevant control period, but that is puzzling. If there is evidence to substantiate an expectation of such productivity growth (if it is in some sense a ‘known’), why is it not better incorporated at the component-by-component cost analysis stage? Doing that would help in discovering more information, in developing better understandings of the potential sources of the growth, and in achieving better quantification. If this is, in fact, the existing approach, then the efficiency frontier adjustment is redundant. If it is not, then why not? Why is the matter left to be settled by a guess, informed only by the thinnest of evidence?
- (90) Such questions point, I think, to another gap in the determinations: they exhibit little understanding of, and little interest in, the factors that influence productivity growth. And lest it be thought that drawing attention to this gap is a bow to the political Zeitgeist, let me add that such an interest is an almost necessary requirement of any regulatory system that gives weight to the *long-term* interests of consumers. The advancement of those interests is heavily dependent on securing productivity growth. The Zeitgeist has, in a sense, simply caught up with where regulatory practice in the UK was in the beginning, and where it should always have remained.
- (91) To start to fill the gap, the first step is to recognise that productivity does not fall like ‘manna from heaven’.⁸ Finding/discovering, then implementing, better ways of doing things requires a constant effort, and productivity improvements are hard won. Changes in business operations and organisation come with costs, which can usefully be viewed as investments in human capital (in both its individual and collective, institutional forms), and these are typically not well recognised in regulatory accounting. Once made, discoveries of productivity improvements yield value over future periods, and, as with physical capital, those periods can comfortably extend well beyond the end-point of a five-year price review period.
- (92) It can be said, therefore, that recourse to the efficiency frontier adjustment as a sort of *deus ex machina* lacks ‘objective justification’. It implicitly assumes that productivity growth is a ‘free good’, which it is not. (If it were, we’d see much more of it.) In a nutshell, *discovery is the principal engine of productivity growth* and it comes with costs that merit appropriate remuneration.⁹

⁸ This was an expression used to characterise the way in total factor productivity growth was incorporated into the seminal Solow/Swan neo-classical growth model (1956). It was not used in a complimentary sense, the point being that the model provided no plausible account of the causes or drivers of the ‘frontier shift’.

⁹ For a very short background discussion see <https://rpieurope.org/the-costs-of-change/>. Briefly, productivity growth (and change more generally) requires reconfigurations in the ways a business deploys its internal resources, and these reconfigurations impose costs of their own, a phenomenon with which anyone with experience of an office or business re-organisation is likely to be familiar. More

9. Incentive regulation and its limitations

- (93) The term Incentive regulation is usually used to refer to a variety of add-ons that can be attached to a routine application of the building-block approach to price determinations, and examples of such add-ons include glide paths, profit/benefit sharing, sliding scales, asymmetric sliding scales, caps and collars, dead bands, fines, and menu regulation. (The last of these offers the business a choice of different sets of parameters for, say, a symmetric sliding scale with a cap and a collar, which has four parameters: a base point, the slope of the rewards-for-performance line, the level of the cap, and the level of the collar. Menu regulation was used, for example, in early determinations of revenues for National Grid's electricity system operator business.)
- (94) By and large, regulators have experimented with this toolkit in attempts to incentivise performance across either the entirety of a business or across fairly broad sub-businesses. This keeps things reasonably simple and transparent and renders evaluation of the effects of the incentive schemes less difficult. Even so, in attempting to make ex-post assessments of these measures, it has proved difficult to disentangle their effects from other factors influencing performance outcomes. Evidence on effectiveness of the various schemes is therefore relatively limited.
- (95) Ofwat's distinction is to have used this 'toolkit' of incentive regulation at a much more disaggregated level than other regulators, for example in the form of the ODIs and the PCDs. The system/network of regulations has been expanded and its complexity has been increased. The cross-effects between Ofwat measures have multiplied, and all these regulations also interact with (a) the fines and penalties of increasingly complex environmental regulation and (b) non-financial normative factors, referred to as 'social facts' in sociology, such as business cultures, professional standards, and shared ethical standards. The Haifa day-care experiment shows that even the introduction of one, very simple, financial reward/penalty scheme can have highly counterintuitive consequences when it is additive to an established normative system. The implications of all this are opacity, greater uncertainty for investors, and likely a higher cost of capital.
- (96) As far as I am aware, no ex post evaluations of the effects of this evolving system of detailed regulation have been conducted, for example via an exercise analogous to the Cabinet Office study mentioned above. The very complexity of it all would no doubt render that a significant challenge, but the trade-offs do have to be assessed, one way or another, when determining the terms on which investors might be willing to supply finance.
- (97) As with complex systems more generally, although understanding of the whole is a 'wicked' problem, it is nevertheless feasible to identify one or two of the major mechanisms at work within it, particularly those engaging the more macro, more transparent variables. In the context of PR24, the interaction between the final decisions on prices/revenues might be a case in point. The cross-effects mean that there should be some consistency between the price/revenue decision and the parameters of the ODIs and PCDs, particularly the parameters that fix the bases from which deviations are measured to determine whether there is a reward or a penalty. This appears to be recognised in the Ofwat determination.
- (98) However, price/revenue determination is not an exact science and requires judgments to be made, so it can be asked: what might be the consequences of an error, such as an overestimation of the efficiency frontier adjustment factor, E? For any given parameterisation of the ODIs and PCDs, it might be expected that, given more limited resources, businesses' net revenues from the incentive schemes will be lower. In other words, in this respect at least, the incentive schemes, seem to serve to *amplify* the effects of the error.
- (99) This, then, is a material issue to be taken into account when considering the determination of E, but it appears to have been missed in PR24. The analysis of the efficiency adjustment, such

as it is, focuses on factors such as past total factor productivity performance in other economic sectors: cross-effects of *errors* in its setting on ODIs and PCDs in the water sector are not examined.

- (100) The opacity of the collective effect of such a large number of prescriptive schemes bears particularly heavily on investors, who have multiple options in allocating their funds, all of which have to be assessed, one against another, when making decisions. They have a much lower capacity to go into the weeds of these schemes and into their collective implications for rates of return than does a specialised regulatory agency with teams of people dedicated to working on a particular sector in a particular country, to assess their likely effects. The call for the effort required to assess the prospects may itself be enough to tip the balance of a judgment on whether or not to engage with the UK water sector at all.
- (101) I recall, for example, that at a Regulatory Policy Institute conference on infrastructure investment about 25 years ago, there was a session that covered the contracts for operating the London underground lines. A financial expert at the podium held aloft a voluminous contract and said, “If this is what the contract looks like, you shouldn’t go near it.” That captures the point.
- (102) I doubt that the implications of the ODIs and PCDs are clear to Ofwat itself, notwithstanding all the regulatory resources that have been put into them. Imagine an Ofwat official being interrogated by a Parliamentary Select Committee and faced with the questions: What evidence can you give us about the actual (not modelled) effects of these schemes on returns to investments? Have you considered that they may have negative effects on the organisational psychology and culture of the regulated business? I am sceptical that Ofwat could give satisfactory answers.
- (103) In the mix of specific incentive schemes, the time-related PCDs appear to be particularly problematic, because they engage the regulator in assessing time-cost trade-offs, introducing yet another layer of de Tocqueville’s “network of small, complicated rules”.
- (104) For any project there will be a function linking expected costs to planned time of completion. Just as Rome was not built in a day, projects cannot feasibly be completed in an instant. There will be a later time by which completion of the project will (just) become feasible, but only by throwing a lot of resources at it and/or by corner-cutting, which itself has costs (lower quality of completed work). For a band of longer times for completion, costs will tend to fall, because of the greater optionality available in configuring resources to get the project done and the longer learning/discovery period for uncovering better ways of working (learning on the job).
- (105) A specific, current example of one aspect of this trade-off is to be found in the electricity sector. Because of the urgency of de-carbonisation policies across OECD economies, demand for transformers has taken a step jump upwards. Orders for equipment that previously took a few months to deliver can currently take years. Network extensions and upgrades are necessarily delayed by factors only weakly controllable by managements. A similar effect can be expected from the quadrupling of new investment over a relatively short time, as required in Ofwat’s proposed regulatory settlement, but I cannot see where Ofwat has factored in these ‘costs of change’.
- (106) To get a sense of the trade-off, imagine the Panel’s task of redetermination as a ‘project’ and ask, what if government set up an incentive scheme with a base point of 6 months? Doing it quicker than that earns a financial payment to the CMA, taking longer will open up the CMA to financial penalties. Then ask, what would be the implications of that for the Panel’s work, the culture of the CMA, the motivation of staff, the cutting of corners, the maintenance of professional standards and the like? Is it obvious that the financial incentive scheme will turn out to be net positive, and not net negative in the fashion of the Haifa day centres?

10. Use and misuse of the Capital Asset Pricing Model (“CAPM”)

(107) The Journal of Economic Perspectives is a publication of the American Economic Association that sits alongside the American Economic Review. Its distinctive feature is that its papers are commissioned from notable economists in a specialised aspect of economics. They are asked to provide a review of the state of knowledge in their own specialism, for the benefit of economists working in other specialist areas.

(108) One of those reviews, by Professors Fama and French, surveyed the then state of knowledge about the CAPM in 2004, forty years after its appearance. Nothing since has significantly disturbed their overall conclusion, which allows me to be brief on this issue.

(109) The end of the first paragraph and the beginning of the second paragraph of Fama and French are as follows:

“Four decades later, the CAPM is still widely used in applications, such as estimating the cost of capital for firms and evaluating the performance of managed portfolios. It is the centerpiece of MBA investment courses. Indeed, it is often the only asset pricing model taught in these courses.

The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk. Unfortunately, the empirical record of the model is poor – poor enough to invalidate the way it is used in applications.”

(110) The ending two sentences of the paper restate the judgment:

“We continue to teach the CAPM as an introduction to the fundamental concepts of portfolio theory and asset pricing, to be built on by more complicated models like Merton’s (1973) ICAPM. But we also warn students that despite its seductive simplicity, the CAPM’s empirical problems probably invalidate its use in applications.”

(111) The CAPM clearly abstracts from a number of major observable characteristics of capital markets (See footnote 1 above) and, in that sense, can be said to be ‘incomplete’. The model nevertheless has its uses as a *heuristic*, a way of looking at things that can help to establish a broader analysis, drawing also on contributions from other heuristics and perspectives. The relative balance of the contributions can be expected to vary from context to context. In some circumstances the CAPM heuristic alone might be sufficient to get to a rough approximation to the cost of capital. In other circumstances the gap to be filled may be greater and the level of uncertainty often plays a major role in accounting for these variations.

(112) Thus, referring back to previous sections, the uncertainties created by a complex system of regulations will be a common feature across the water companies. And, if that were the only issue, it would not have much impact on the (CAPM-estimated) cost-of-capital *relativities* between different companies. One common adjustment to the CAPM estimates to reflect general, sectoral uncertainties might be sufficient unto the day. On the other hand it might not: there may be company-specific factors that also should be taken into account.

(113) Thus, for example, the liquidity issues and the wider uncertainties about the future of Thames Water, suggest that the CAPM heuristic may yield a cost of capital estimate that is likely to be wider of the mark. Among those wider uncertainties are those to do with the calibration of diseconomies of density discussed above. Thames is clearly an outlier in terms of density and in consequence it is much more vulnerable to regulatory uncertainties surrounding estimation of density effects than the other companies appear to be.

- (114) Should the PR24 decisions concerning Thames come to the CMA for redetermination, I think there is a strong economic case for treating it as *sui generis*, calling for a cost of capital assessment significantly deeper than the CAPM, even if the CAPM estimate has already been adjusted by a sectoral allowance for more general uncertainties. “Mind the gap” might be a good thought to keep in mind when it comes to London.
- (115) Given that a particular mode of application of the CAPM is deeply embedded in UK regulation, the opening citation of Keynes is particularly apposite at this point. It can be hard to abandon old orthodoxies, but so it must be when the facts of new contexts indicate that their retention would be a road to folly, or perhaps even institutional extinction.

11. The Special Administration Regime

- (116) The SAR, only very recently amended in significant ways in 2024, raises difficult issues of assessment because, being hitherto untested, there is little evidence to work with in assessing its potential consequences.
- (117) The mix of economic and legal issues is far beyond the competence of a solitary economic analyst to bottom out, but there are nevertheless a few points that can be made. The first is that, with little experience to go on, if the process is triggered there will be scope for significant learning as it unfolds. For reasons given earlier, an expectation of enhanced learning opportunities is another way of saying that uncertainty will be elevated.
- (118) Second, in the case of Thames Water, recourse to the SAR is a realistic possibility, notwithstanding the current (at the time of writing) discussions with Ofwat. The outcome of those is just another uncertainty for now: we know we will know more in a few months’ time and will adjust the assessed likelihood of recourse to the SAR then, but we don’t know what that adjustment will look like.
- (119) Third, the revenue allowances, as at the time the SAR is triggered, whenever that might be, can be expected to be taken as givens by the Administrator. His/her duties and powers do not encompass an ability to make further re-determinations. The allowances can be said to be ‘parametric’ for the conduct of the SAR process.
- (120) Fourth, the determined parameters are not ‘redundant parameters’: the allowances will affect the future revenues and returns of the entity involved, and those are things that can be expected to affect SAR outcomes.
- (121) Fifth, in consequence of these points, consideration of the implications of the SAR should be an aspect the re-determinations. They affect an opening parameter of the SAR process, which can be expected to affect outcomes for consumers, investors, the costs of the process, and arguably the Government’s balance sheet. And over a five-year period that promises to be one of great change, there is no guarantee that the SAR will be an irrelevant factor for companies other than Thames.
- (122) Finally, so far as I can see, the Ofwat determinations do not appear to have given anything like ‘due consideration’ to this material factor.

12. Ways forward?

- (123) As stated in the Introduction, it is not my task to come up with specific proposals for changes to the determinations, but there are a number of pointers that can be drawn out of the preceding discussion about lines of development in thinking that could offer potential improvements on the Ofwat decisions. A few are listed here:

1. Acknowledge that there is more to estimating the cost of capital than current usage of the CAPM. More specifically, and particularly in a period where major changes in the conduct of the businesses are anticipated, the effects of uncertainty merit weighty consideration.
2. Re-run all modelling equations that might be affected by density factors with both density and squared-density variables included and take the resulting fitted relationship as a better account of the data. It can then be discovered whether or not this has a material effect on the allowances.
3. Acknowledge that, considered as a set, it is uncertain whether or not the ODIs and PCDs have any net beneficial effects whatsoever. As they stand, they are akin to an experiment whose results have not been thoroughly examined.
4. Abandon the financial rewards and punishments for at least the time-related PCDs, and consider doing the same for other PCDs and for ODIs. Retain the base points as aspirational targets, and replace financial penalties with reporting requirements that Ofwat can publish as league tables. (Show a human, or groups of humans, a league table and they will start to compete.)
5. Discount the efficiency frontier factor on grounds that it is far too speculative for the times and implicitly rests on a ‘manna from heaven’ approach to productivity growth. Instead consider the possibility of developing a macro (across the companies) productivity incentive scheme that recognises that discovery and change come with costs. (A hot tub of economists could probably come up with some specifics in an afternoon.)
6. Interrogate Ofwat’ statistical and modelling methodologies, remembering that, when they come in conflict, models and hypothetical constructs must submit to observational data, not the other way round.
7. Give the implications of the SAR due consideration in the redeterminations.

George Yarrow

April 2025

Annex 1

Uri Gneezy and Aldo Rustichini, A fine is a price, Journal of Legal Studies, January 2000.

Abstract

“The deterrence hypothesis predicts that the introduction of a penalty that leaves everything else unchanged will reduce the occurrence of the behavior subject to the fine. We present the result of a field study in a group of day-care centers that contradicts this prediction. Parents used to arrive late to collect their children, forcing a teacher to stay after closing time. We introduced a monetary fine for late-coming parents. As a result, the number of late-coming parents increased significantly. After the fine was removed no reduction occurred. We argue that penalties are usually introduced into an incomplete contract, social or private. They may change the information that agents have, and therefore the effect on behavior may be opposite of that expected. If this is true, the deterrence hypothesis loses its predictive strength, since the clause “everything else is left unchanged” might be hard to satisfy.

Comments

- (1) The study is an example of ‘experimental economics’, an approach that I wholly endorse, one of a family of experiments that have served to undermine the notions in economics that the incentives that matter are chiefly of a financial nature or are restricted to considerations of ‘outcomes’. The most famous of these is probably the ultimatum game, on which I have written and lectured previously.
- (2) The first point is that human conduct is governed by rather more than individual ‘financial payoffs’, to which I hope readers of this will say “that’s obvious”. Inter alia, there are normative systems in play, what sociologists refer to as ‘social facts’, which can be said to ‘regulate’ conduct. Prior to the experiment, they are what governed the conduct under examination (times of pick-ups). The financial penalty was introduced and lay alongside this normative system.
- (3) The cutting edge of the experiment is that it examines what happens when the financial penalty is added to an existing ‘regulatory system’. As the evidence indicates, the outcomes were the opposite of what might have been expected from a narrow, economics perspective. And, it can be added that this is by no means an unusual finding when regulations are examined one-by-one, without heed to a wider system.
- (4) In the abstract above, Gneezy and Rustichini, refer to the pre-fine situation as one based on an incomplete contract, but my own view is that this is to cast it in terms of a still too narrow social science. Whilst judging it as ‘not wrong’, there is more to be said, and it has been previously said, most notably in 1759, in Adam Smith’s *Theory of Moral Sentiments*.
- (5) Put very simply, as social animals we are hard wired, to greater and lesser degrees, to find satisfaction in the approval of our conduct afforded by others and be dis-satisfied by disapproval. The rules are set by the day-centre and parents sign up to them. Lateness brings disapproval on the errant parents, first and most obviously from the teachers (because ‘due consideration’ has not been given to their own time schedules), but also from other parents (teachers’ time should not be under-considered in this way).
- (6) Now comes the fine. That will have to be considered by the errant parents: they will have to pay it. Moreover, it introduces some reciprocity/compensation/restitution that was absent before. The degree of disapproval is reduced. The thief who ‘pays the price’ can expect a bit more sympathy than the thief who ‘gets away with it’. The force of the ‘social facts’ is weakened.

- (7) For the persistent offender, justifying the lateness is easy; “OK, I am imposing extra costs, but I am paying for those extra costs.”
- (8) Being empirical in nature, the precise outcomes in the day-centre experiment cannot be generalised to other contexts – the outcomes might depend, for example, on the level of the fine – but the overall message is one of great generality. It is unsafe to examine any perturbation in a system of regulation on a stand-alone basis. *Ceteris paribus* assumptions are to be avoided like the plague.

Annex 2

Electricity distribution in New Zealand

- (1) The diagram in the paper is taken from a report commissioned by the Energy Trusts of New Zealand (“ETNZ”). ETNZ represents regional energy trusts located throughout the country which are owners of companies operating electricity distribution networks (lines businesses) on behalf of local consumers and communities (including municipalities).
- (2) The work was triggered by a growing sense at the national political level that many of the trusts were inefficient on account of their small scale and that a policy of consolidation should be pursued. In part this was stimulated by an International Energy Agency Report (“IEAR”) on Electricity Distribution in New Zealand, which was enthusiastic for consolidation in the sector.
- (3) It was a poor report which, among other things, made a series of effortless transitions from statements like ‘consolidation *might* increase efficiency’ to conclusions that consolidation would be desirable, leaving large gaps of reasoning in the shift from ‘might’ or ‘could’ to ‘will’ or ‘can be expected to’.
- (4) Subsequent to the IEAR, the NZ Government set up an Electricity Price Review to examine the more general picture in the sector. In its First Report, the Review included a diagram showing a plot of regional/area prices against size for the 28 electricity undertakings in the country. Sure enough, the relationship was a negatively sloped, convex curve, and the interpretation given to it was that it indicated substantial economies of scale.
- (5) This was, of course, to ignore the effects of density on costs and prices. Empirically, scale and density are fairly highly correlated across the sample, so a bivariate regression using only scale will capture effects of density. There was an attribution exercise to be done.
- (6) The diagram shown comes from a short technical annex to the paper, exhibiting some basic (almost back-of-envelope) econometrics, initially a two variable (scale and density) regression. This left the software to determine the best attribution. I wasn’t expecting much from the exercise, because of the collinearity between the variables. Standard errors would likely be high (because of the collinearity), but at least the equation would give a ‘best’ point estimate of the attribution, and that could be enough to conclude that density should not be ignored.
- (7) In fact, the output pointed, with a high degree of confidence, to density as the prime driver, with a ‘best’ attribution of 97-98% density and 2-3% scale.
- (8) In the event the Price Review did not recommend a policy of consolidation, and the Government accepted that advice.

Professor Yarrow: biographical details

Professor George Yarrow is one of the founders of the Regulatory Policy Institute, established with the support of Hertford College, Oxford University, in 1991, and remains an Emeritus Fellow of that College.

In the course of his academic career, after graduating from Cambridge University, he has been associated with the universities of Warwick, Newcastle, Oxford, London, Harvard and California (San Diego). His principal academic work has been in the areas of privatisation, regulation and competition, but he has also published papers in monetary, financial, health and environmental policy economics, and monographs on reform of social security and the welfare state. Some of his more significant papers/books have been translated and re-printed for a global readership, including in Chinese, Spanish, Polish and Italian. He has also been a member of the editorial boards of a number of economic journals and has acted as a Nominator for the Nobel Prize in Economics.

Throughout his career, Professor Yarrow has advised public sector bodies and the private sector on a range of economic and regulatory issues, across all continents. For example, he has acted as advisor to the Civil Aviation Authority and was a member of the National Audit Office's advisory panel on regulatory impact assessment. At the time of the first electricity privatisations, he was an advisor to the National Grid on the development of the charging structures for use of the high voltage transmission system in England and Wales. In later years he has been: involved in two reviews of energy sector governance in Australia, chairing one of them, on the appellate arrangements for contested price controls; a member of the Republic of Ireland's Aviation Appeals Panel (twice); and the development of new arrangements for governance of the New Zealand regulated sectors (electricity, gas and airports), chairing a panel of expert economic advisors to the NZ Commerce Commission).

Professor Yarrow also acted as an external adviser to Ofgem for a number of years in relation to, among other things: the development of transmission charging principles; grid access arrangements more generally; capacity auction arrangements in gas; deregulation of gas storage; retail price deregulation in electricity and gas; various aspects of price controls; and implementation of competition law in the energy sector. He was for a time a member of the Ofgem Executive and then, later, a Non-Executive Director of the Gas and Electricity Markets Authority (GEMA).

In retirement and back in Cambridge, he continues to serve as Trustee/Treasurer of the Regulatory Policy Institute, an independent educational charity whose object is to promote the study of regulation for the public benefit, and he maintains an active research interest in three main areas: what brain science can teach us about the effective structuring of information and decision making processes, particularly in government; the drivers of productivity growth; and the regulation of immigration. All three are motivated by a perceived need to think carefully about how regulatory rule-books should be developed in new, unprecedented contexts, particularly when existing arrangements are observed to be going off track.

IN THE MATTER OF WATER INDUSTRY PR24 REDERMINATIONS
PROCEEDING BEFORE THE COMPETITION AND MARKETS AUTHORITY

**THIRD PARTY SUBMISSION OF AN AD-HOC GROUP OF
INVESTORS HOLDING THAMES WATER'S CLASS A DEBT**

Introduction

1. This submission is made on behalf of an ad-hoc group of long-term UK infrastructure investors holding Thames Water's Class A debt (the 'Investor Group'). The Investor Group has already written to the CMA on 10 April 2025 to express its desire to participate as an interested third party in connection with the CMA's water price control redeterminations for Anglian Water, Northumbrian Water, South East Water, Southern Water and Wessex Water.
2. Notwithstanding that the referral of Thames Water's redetermination has been deferred by agreement with Ofwat, there are a number of industry regulatory issues which: (i) will or may affect one or more of the other companies for which redeterminations are pending before the CMA; and (ii) which may in due course affect the Thames Water redetermination. This submission addresses five such issues. We refer to the expert analysis and commentary accompanying this submission from Professor George Yarrow, Director of the Regulatory Policy Institute and from Dr Boaz Moselle and Dr Dermot Nolan of Compass Lexecon, a leading firm of economic consultants.
3. The balance of this short submission:
 - (a) describes the approach which the CMA is invited to take to the redeterminations;
 - (b) sets out certain overarching features of PR24 at an industry-wide level which are deserving of significant attention in the course of the CMA redeterminations;

- (c) summarises five overarching areas in which Ofwat's approach to the PR24 final determinations is plainly flawed and so fails adequately to grapple with the challenges facing the industry; and
- (d) sets out how those issues should be addressed in the course of the redeterminations.

Approach CMA is invited to take to the redeterminations

4. The CMA will be well familiar with the scheme of the Water Industry Act 1991 (the 'Act') and the matters which Ofwat must consider under s. 2(2A). This submission is made on behalf of a group of debt investors who perceive a risk that the UK water industry is becoming unfinanceable, contrary to s. 2(2A)(c) of the Act. For the most part, however, this document is not focussed on returns on capital but on substantive features of the PR24 determination which are of particular concern to the Investor Group.
5. The purpose of this submission is to identify apparent errors and inadequacies in Ofwat's approach which should carefully be considered by the CMA in the redeterminations as matters which are of significant concern to the industry's creditors. It is not the role or purpose of this non-party submission and accompanying expert material to *prove* the errors or inadequacies. Indeed, proof of error by Ofwat is not a necessary part of the CMA redetermination process at all. The CMA makes a *new* determination: see *CMA's Final Report on PR19 Redeterminations*, 17 March 2021, §§3.16-3.18. The Investor Group respectfully asks the CMA, when making its determination, to give its most careful attention to the topics we describe below.

Overarching features of PR24 at an industry level

6. Ofwat and the industry appear to agree that an unprecedented level of spending is required in AMP8 (i.e. the period of PR24). Totex of £104 billion compares with £51 billion in PR19. Enhancement expenditure in particular is projected at £44.6 billion, a 3.4x increase on PR19. The extent of the enhancement expenditure means that, by the end of the five-year period, companies will have a significantly different set of operating assets from those which they had at the beginning. Thames Water, for example, which has a current RCV of £20.4 billion, is expected to spend £8.3 billion on enhancements in AMP8. Each of the projects forming part of enhancement expenditure involves execution and financial risk in its delivery which is not comparable to the risk profile of an already built asset base.

7. The step-up in water industry expenditure is a paradigm shift; indeed, it is so large that it represents a significant increase in demand for the UK's wider markets in relevantly skilled labour and construction capabilities. Estimates place the size of the entire UK civil engineering project construction market at around £41-45 billion p.a.¹ In the long term, the supply side of the market is likely to respond to demand, but the time taken – in particular for workers to respond to market signals and obtain relevant sectoral skills and experience – means that there will almost inevitably be a period of supply-demand imbalance (which may be manifested in price inflation, availability shortages or both). That imbalance will occur in an economy where competition for skilled construction labour is already likely to be intensive in any event due to government policy on housebuilding, infrastructure and clean energy.
8. The water industry is entering this phase of unprecedented expenditure and likely supply-side constraint while shackled with a regulatory scheme which: (i) is increasingly and excessively prescriptive about what must be delivered and when; and (ii) imposes penalties for non-delivery or delayed delivery which are out of all proportion to the harms occasioned by such slippages. As developed in greater detail below, the current regulatory settlement is of the 'complex and tightly coupled' kind (indeed, in some respects it is contradictory), which magnifies the risk of catastrophic failure.
9. In parallel, the money required for the industry's unprecedented expenditure will generally have to be raised from equity and/or debt markets, rather than funded from retained earnings. Ofwat's financing duty requires it to secure that companies are able to raise finance for necessary expenditure (or at least, as Ofwat interprets it, that companies could do so based on a notional efficient capital structure). However, the reality is that while financing markets remain open to the water industry, the terms on which finance is available (and is likely to be available in future) have worsened appreciably over the past year or more. Those worsening terms reflect the risks of the future and the legacy of the past. As to the future, markets simply require a higher return to finance large, risky expenditure in an inflexible and punitive regulatory environment. As for the past, experience has taught (and is in the course of teaching) equity and debt investors that UK water is a place where, if companies fail to achieve in practice the ideals of the regulatory

¹ IBIS World, *Civil Engineering Project Construction in the UK - Market Research Report (2015-2030)*; Mintel, *UK Civil Engineering Market Report 2023*

econometric model, heavy capital losses will result. That risk of loss is reflected in the real-world price of finance for all water companies (and, it follows, for all notional capital structures too).

Issue 1: Ofwat fails to recognise the magnitude and dynamics of the challenge created by unprecedented levels of industry-wide expenditure in PR24

10. Neither Ofwat nor the water companies have it within their power to prevent a supply-demand imbalance from occurring as a result of the ramping up of expenditure. But the regulatory settlement needs to recognise the difficulties which are likely to arise and deal with them appropriately. Leaving cost of capital issues aside, the final determinations fail to deal with the likely forthcoming supply-demand imbalance in two respects: (i) inadequate adjustment for price effects; and (ii) inadequate accommodation of availability effects. Before turning to those it is important to note that nowhere in the extensive PR24 Ofwat materials is any thought or detailed analysis given to the cumulative effects of such a large injection of spending across the water companies as a whole (whether regionally or nationally); nor is any attempt made to contextualise or make provision for the potential effect of such expenditure in present market conditions.

Price effects

11. In general, allowed revenues and expenditure rise each year by a broad-based inflation factor, namely the percentage change in the Consumer Prices Index, including owner-occupier housing costs (CPIH). To the limited extent that industry-specific cost inflation feeds through into general headline inflation, it is likely to be met with monetary policy responses aimed at containing inflation to 2%. Hence, allowed revenues and expenditure will not reflect changes in industry-specific costs of the kind which may be anticipated.
12. The final determinations contain a suite of measures to address what Ofwat terms ‘real price effects’, i.e. the risk that inputs will come to cost more, even having adjusted for inflation: see *PR24 Final Determinations: Expenditure Allowances*, p. 260 §4.1. These measures are, however, inadequate to address the problem for the reasons set out below. What is more these adjustments for the risk of *rising* costs are offset by a hypothesised but unevidenced ‘frontier shift’ in efficiency, i.e. an assumption that in real terms a given level of output will become *cheaper* to procure year-on-year.

13. For labour costs – where it is reasonable to anticipate the companies will be in vigorous competition with one another to hire or retain the skilled workers to deliver both increased base activity and hugely expanded enhancements – Ofwat makes an *ex ante* adjustment based on OBR forecasts for earnings and an *ex post* adjustment (i.e. a true-up operating at the end of AMP8) based on outturn wage growth using: (i) the ONS ASHE manufacturing wage index for wholesale base labour costs; and (ii) the ONS ASHE construction wage index for wholesale enhancement labour costs. Neither of these measures may be expected adequately to capture water industry-specific wage inflation arising in the way anticipated (i.e. due to unprecedented sectoral expenditure driving a race to obtain those with the skills to deliver the works required). Manufacturing and construction jobs are not interchangeable without re-training and the accumulation of new experience, which itself can occur only after participants respond to market signals (i.e. persistent sectoral wage differences) justifying the costs of changing one's line of work. Manufacturing and construction together amount to around 14% of UK GDP/employment, of which water is only a small part.²
14. For materials plant and equipment costs (MPE), Ofwat makes no *ex ante* adjustment, no *ex post* adjustment for base expenditure and an *ex post* adjustment for enhancement expenditure based on new infrastructure construction output prices published by the ONS. The absence of any adjustment for base expenditure is obviously insufficient where base expenditure will also face inflationary pressure, both because: (i) industry-wide base expenditure of £61.4bn for PR24 represents a material (61%) increase over the prior period; and (ii) base and enhancement work will draw on substantially overlapping pools of labour and capital. As for the MPE true-up on enhancements, the ONS infrastructure construction output prices index is too broad a measure to have any confidence that it will effectively compensate for rising water-industry-specific costs.
15. Both the labour and MPE *ex post* adjustments impose additional financial stress on water companies because they occur only at the end of the pricing period, leaving companies underfunded meanwhile for up to five years. This poses an acute risk where there is

² House of Commons Library Research Briefing, *Manufacturing industries: Economic indicators*, 11 April 2025; *The construction industry: statistics and policy*, 16 December 2019

considerable doubt about the abilities of many companies to maintain investment grade credit ratings given the myriad other challenges in the overall settlement.

16. What little is given by these real price adjustment mechanisms is then taken away by Ofwat's assumption of a 1% 'frontier shift' in efficiency, supposedly a proxy for expected technological progress. This is problematic both because of a lack of evidence that the water industry stands to benefit from such a shift and because, on a theoretical level, it introduces with a negative sign, some of the very same factors as drive input cost inflation and the compensatory 'real price effect' adjustments (as explained at §19 below).
17. Ofwat has deliberately not looked at water industry efficiency changes for fear of creating perverse incentives (*Ibid.*, §4.1.1). This extraordinary hypothesis – that water companies would deliberately create a drag on productivity to influence future price reviews – ignores the fact that individual companies would: (i) enjoy the whole of the advantage of any efficiency improvements they could achieve; but (ii) suffer from those efficiency improvements in any future price review only insofar as their own efficiency improvement fractionally moved the industry average. Instead, Ofwat has principally based its frontier shift assumption on time-series data spanning 40 industries over 28 years from 1995 to 2023. There is, however, no reason to believe (and certainly no evidence to suggest) that the water industry in 2025-2029, in a period of massively expanded activity (both in terms of quantum and nature of work/projects) will enjoy such efficiency improvements.
18. As Professor Yarrow observes, technological progress does not fall like manna from heaven. In order for a frontier shift to be justified there would, at the very least, have to be: (i) a plausible intuitive reason to believe that technological progress was meaningfully likely to exert downward pressure on water industry costs during a construction boom; and (ii) some foundation for such hypothesis in evidence. The examples given by Ofwat – that the costs of water and sewerage infrastructure will be driven down by artificial intelligence, big data, robotics and information technology generally – fail the test of intuitive plausibility. The principal evidence on which Ofwat does rely, an aggregate of data stretching back to the 1990s, is beset by obvious problems of heterogeneity.
19. Even if the frontier shift were correctly calibrated for technological progress in the manufacturing and construction industries as a whole, it undermines the *ex post* wage adjustment insofar as it attempts to address water industry costs. Assuming (in the absence

of a hypothesis to the contrary) that labour's average share of industrial output remains the same over AMP8: (i) any technological progress over the period will, by definition, lead to increases in output per unit labour; and (ii) this will lead to the same percentage increase in wages. If technological progress occurs generally but does *not* accrue to the water industry specifically (or does not do so to the same extent as in other industries), the effect of the frontier shift will be to claw back the labour 'real price effects' adjustment.

Availability effects

20. Another likely result of the expenditure step-up and attendant supply-demand imbalance is the likely unavailability of labour and/or MPE. In many market environments, the price mechanism can deal completely with scarcity of supply: an increase in demand (i.e. an outward shift in the demand curve) leads to price increases and quantity of supply increases insofar as there is some short-term flexibility in supply (i.e. provided the supply curve has some upward slope). The assumption that pricing can deal with scarcity is, however, confounded where demand and supply *both* exhibit low price elasticity. The paragraphs above have already explained why in the short- to medium-term, elasticity of labour supply is limited: see §§7 and 13. That is not to say there is no elasticity in supply: skilled workers can come out of retirement or move from part-time to full time roles and will do so, particularly for the right wage. But elasticity has obvious practical limitations in the short- to medium-term.
21. The structure of the overall water industry settlement in PR24 is, in a number of respects, so inflexible that it will inhibit demand elasticity. Price control deliverables (PCDs) are a new regulatory tool in PR24 and their operation is untested, let alone in the context of a huge upturn in sectoral expenditure. They are intended by Ofwat to '*incentivise companies to deliver on time*' and apply to around 80% of enhancement expenditure and some aspects of base expenditure such as mains renewal and network reinforcement (*Ibid.*, §4.7.2).
22. Non-delivery PCDs apply where a project is not delivered by the end of AMP8, save that waiver applications may be made for project which will be no more than a few months late. If a waiver application succeeds, there is then a monthly late delivery penalty. Where the non-delivery PCD applies, companies forfeit 100% of the allowed expenditure or 94% where they can demonstrate the project was no longer required and non-delivery was in the interest of customers. To suggest that this will '*incentivise companies to deliver on time*' is perhaps an understatement, as material late delivery will represent a total loss.

23. Non-delivery PCDs are clearly the wrong incentive tool to introduce for the first time in a period of unprecedented industry-wide expenditure and likely supply-side constraint; and against a backdrop of an expanded range of outcome delivery incentives (ODIs) alongside which they must be assessed. PCDs are bound to operate unjustly in many cases; they increase risk and will lead to a lack of elasticity in demand thus exacerbating supply shortage. The only alternative for companies faced with the risk that they cannot deliver by the end of AMP8 is to refrain from commencing otherwise viable projects. If this occurs, it will be a perverse effect of PCDs, will be harmful to consumers and the environment and will increase the risk that companies suffer penalties under ODIs because they have not commenced projects which would have been necessary to meet Ofwat's performance targets (confusingly called 'performance commitments') and may have, for essentially the same reasons, fallen short on comparative measures of service experience (MeXes). The interaction of these incentive schemes will thereby create a 'no way out' dilemma for companies faced with labour or MPE supply constraints affecting deliverability. They may face further penalties from environmental or water quality prosecutions.

Issue 2: The past is an unreliable guide to the future

24. Issue 1 highlighted the significance of the change in the *scale* of expenditure required in AMP8. The change in *mix* of expenditure is also significant. In many cases, changes are driven by new or increasingly exacting regulation (for instance, on nutrient neutrality) or by different regulators or by external factors, for example the changes in what the Environment Agency considers to be acceptable practice for Industrial Emissions Directive compliance, which are expected to lead to materially different kinds of sewage works enhancement projects being commenced in AMP8.
25. Two overarching conclusions immediately follow from this change in mix of activity: (1) delivery of future projects will be riskier because they represent a shift away from companies' established areas of expertise (for instance, routine mains pipe renewal) on which they have obtained a learning-by-doing advantage historically; and (2) econometric modelling, whether of costs or expected outcomes, which relies on past data may be unreliable. As explained in the following paragraphs, the 'frontier shift' and Ofwat's various 'efficiency challenges' are particularly unreasonable in this context.

26. Ofwat expects companies over AMP8 to achieve significantly improved outcomes across the board. Expected headline improvements in AMP8 include a 17% reduction in leakage, a 17% reduction in external sewer flooding, a 27% reduction in internal sewer flooding, a 28% reduction in phosphorous entering water courses and 29% fewer water quality customer complaints: see *PR24 Final Determinations: Sector Summary*, pp. 8, 23. In the longer run, Ofwat expects to halve leakage by 2050 and reduce phosphorous by 80% by 2038: *Ibid.*, p. 12. This comes against a background of industry improvement on many of these metrics in past periods.
27. All the regulated companies, excluding perhaps some of the smaller water-only companies, operate in varied geographies – some inherently more challenging, others less – and have diverse asset bases. In making operational improvements (whether falling under base or enhancement expenditure), therefore, companies will face a range of possible areas in which to spend resources: at the one extreme straightforward, low-cost projects expected to achieve meaningful improvements in relevant metrics; at the other extreme, complex, costly projects leading to marginal improvement. Rational companies may be expected to pick the low-hanging fruit first. They have also been required by Ofwat to do so, when Ofwat has approved previous enhancements, for instance STW engineering works or CSO improvements. It is also desirable from an environmental and consumer point of view that the industry should, as a matter of preference, carry out those projects offering (say, again taking CSOs as an example) material environmental benefits for reasonable cost. But what this means is that over time, the marginal cost of improvements is likely to continue to rise, as the balance of remaining projects shifts to those offering more marginal environmental gain or presenting (through complexity of solution) greater costs.
28. Not only does Ofwat fail to account for the obvious risk of increasing difficulty of improvements when projecting future enhancement costs from past data, but it expects the industry to achieve *more* with the same level of expenditure as in the past. Reference was made at §16-18 above to the ‘frontier shift’, an unevidenced assumption that industry can achieve ever more for the same level of real expenditure with each passing year. In addition, Ofwat imposes a series of ‘efficiency challenges’ on base costs and on some enhancement expenditure. The purpose of efficiency challenges is said to be to ‘encourage[] lagging companies to catch-up with the leading companies in the sector’: see *PR24 Final Determinations: Expenditure Allowances*, §§2.1.

29. The idea that the least efficient companies should catch up with the most efficient is seductive, but rests upon a prior error, which is to assume that cost variation is necessarily a function of relative (in)efficiency. In fact Compass Lexecon's analysis suggests that variation in companies' efficiency scores is far too great plausibly to be explained by actual variation in efficiency: see §§4.46-4.52. More likely, the observed variation in score reflects the fact that Ofwat's econometric modelling fails to capture idiosyncratic costs of different undertakers (i.e. material variations between infrastructure and operating conditions as between undertakers). See further issue 3 below in relation to Ofwat's unreliable econometrics. If that is correct, even in part, the efficiency challenge requires companies to do more with less, when in fact the changing expenditure mix and the gradual elimination of low hanging fruit suggest that more expenditure will be required to sustain the same or similar levels of past improvement.

Issue 3: Ofwat is too beholden to unreliable econometrics

30. Issues 1 and 2 identified above sit atop a series of econometric models which are not satisfactorily grounded in evidence and have not been so grounded in recent price control periods. Intuitive support for this argument can be found in the model's historical lack of predictive power in aggregate: for instance, as described at §41(c) below, the vast majority of the industry is in a net penalty position for AMP7.
31. The aggregate position, however, conceals a much larger degree of variation for individual companies and schemes between the performance and cost variables as modelled and the outturn. Compass Lexecon's analysis shows that across industry, the predictive power of Ofwat's modelling is very low: for enhancement expenditure, regressions of modelled costs and outturn costs at the scheme level exhibit r-squared between 30% and 53% in more than half the models examined (§4.25). To take two examples from Severn Trent by way of illustration, from either side of the best-fit line:
- (a) Improvements at Gotham Sewage Treatment Works (building two new storm tanks) had actual costs of £9.0 million, compared with £2.9 million predicted by Ofwat's linear model and £3.5 million predicted by the logarithmic model (including the log bias adjustment);
 - (b) Improvement at Ashbourne Sewage Treatment Works (building new settlement tanks, sludge plant and refurbishment of oxidation ditches) had actual costs of £1.4 million

compared to £7.8 million predicted by Ofwat's linear model and £11.6 million predicted by the logarithmic model (including the log bias adjustment).

32. The question therefore arises whether such discrepancies between actual performance and Ofwat's modelling show: (i) as Ofwat seems to suppose, a separation of the sheep from the goats, with efficient companies outperforming the model and inefficient companies underperforming; or rather (ii) a lack of robustness in the modelling. In a number of areas, once the modelling is examined in detail, the latter explanation is comfortably the more convincing.
33. In addition to the central problems with the economic modelling of enhancement costs considered in depth by Compass Lexecon, one example of a deficiency of modelling is the 'frontier shift' in base and enhancement expenditure described at §§16-18 above – an assumption that a reasonably efficient undertaking will be able to achieve persistent, cumulative, year-on-year efficiency improvements without either an intuitively plausible explanation for this progress or any proper evidential foundation.
34. Another significant example concerns inadequate modelling of the density variable in construction costs. This is the subject of commentary by Professor Yarrow (§6 in his report) and detailed quantitative analysis by Compass Lexecon (§3). In short, there are strong intuitive reasons to consider that increasing density results in economies of scale (at low densities) and diseconomies of scale (at high densities). Such intuitive reasoning can assist in econometric modelling insofar as it helps to explain why certain trends exist in the data. In the case of density, for example, it might explain why the data was better fitted to a quadratic function than a linear function. Professor Yarrow explains that intuitive reasoning was able to perform precisely that role in an assessment of New Zealand electricity utility costs where undertakings had variable rural/urban portfolios.
35. What intuition cannot do is help to populate an econometric model where there is an absence of data. Ofwat has historically collected costs data only at the company level, with the result that there are just 10 data points where wastewater is concerned or around twice as many for water supply. The data has been collected over a number of years, but this adds little where year-on-year variation is limited. This results in two shortcomings:
 - (a) First, aggregating costs at the company level and comparing with weighted average density will tend to elide the economy and diseconomy effects, such that a company

with both very dense and very sparse areas of operation will occupy a similar position on the independent variable axis as a company in the density ‘sweet spot’, despite the intuitive expectation that such companies would experience very different density effects based on a combination of the economy and diseconomy effects.

- (b) Second, even once density has been unhelpfully averaged out on a per-company basis, there is *still* only a single truly high-density datapoint, namely Thames Water. By way of example, Thames weighted average density (MSOA) is 7,000 in contrast to the other wastewater undertakings which are all grouped in the 1,700 to 3,300 range. With this shortage of data, a regression analysis cannot meaningfully predict the costs of an entity with average density approximately 120 to 310% higher than all other observed data points.

36. The enhancement costs issues, frontier shift and density are just three examples where Ofwat sets prices in PR24 based on econometric modelling which does not stand up to scrutiny. It may be that changes in Ofwat’s approach could solve these problems in future Price Review periods – on density, for example, by collecting more granular data on costs (rather than aggregating at the company level) so that differences between the cost of carrying out work in urban and in rural areas could properly be observed. Whether that approach is open on the CMA in the redeterminations depends on practicalities outside the knowledge of the Investor Group. In any event, however, if satisfactory econometric modelling is not possible, Ofwat and the CMA must not use the current defective product. There are other possible approaches to regulating cost – including detailed scrutiny of company projections and bottom-up estimation of efficiency gains – which must be preferred over inadequate econometric modelling.
37. The problems mentioned in this issue 3 are not new for PR24. In the past they have been a drag on the performance of the sector as a whole and have affected different companies to different degrees, a largely latent and bearable weakness. The unreliability of the econometrics now, however, represents an impossible foundation for AMP8, and the paradigm shift for scale of works and the financing thereof it represents, where, as noted above at §6, companies are expected to finance expenditure so significant that most will exit the five-year period with a radically altered operating asset base from they which they had at the outset.

Issue 4: Incentive schemes are over-engineered and downside-weighted

38. Issue 1 above highlighted a single example of how the incentive schemes in PR24 could operate perversely and interact in a way which compounded downside risk. The observation that non-delivery PCDs are likely to affect participants at the same time as ODI / MeX penalties (i.e. in circumstances where ambitious programmes cannot be delivered in the contemplated time frame) and therefore produce compounding effects is not merely a reason to believe that price elasticity of demand will be limited; it is also a bad thing in itself because it risks creating a self-reinforcing downward trend in investment and outcomes. This problem is likely to be particularly acute for companies which (as a matter of fact rather than as a ‘notional’ regulatory construct) already have stressed capital structures with limited headroom to preserve investment-grade status.
39. The PCDs, ODIs and MeXes are individually complex and their likely interaction in a range of real-world outcomes is more complex still, given the nature of overlap/duplication in subject-matter. As Professor Yarrow describes it (in §4 of his report), complex systems are a source of ‘wicked problems’, i.e. those to which there is no realistic prospect of responding with what would ordinarily be classified as ‘solutions’. The shortage of relevantly skilled labour and MPE discussed under issue 1 may be one such example of a wicked problem in the PR24 regime, but the broader point – which is intuitive and which Professor Yarrow illustrates with examples – is that multiple regulatory constraints which interact with one another are necessarily difficult reliably to evaluate, a fact which necessarily undermines their effectiveness as incentives.
40. This problem of complexity can and should be seen in comparative terms: no other economic regulator uses even a small fraction of the number of incentive measures used by Ofwat – see Compass Lexecon’s comparison with Ofgem (§§5.14-5.18, 5.106) – still less does any such regulator use an analogue to the PCDs. And the rationale of ODIs – incentivising operators to improve performance against a range of performance metrics whilst leaving it to the operator judgment as to where and when best to achieve such improvements through related investment decisions (a factor relied upon by Ofwat to found its assumption that the upsurge in expenditure will not produce inflationary effects because the increase in demand can be mitigated by the flexibility of operators as to when to commission works) – is then undermined by the micromanagement approach of the PCDs. The use of both ODIs and PCDs together is incoherent.

41. Complexity and coherence aside, the measures comprising the PR24 incentive package are mis-calibrated and heavily downside weighted. While calibration is to some extent a company-specific issue, some observations may be made at the industry level:

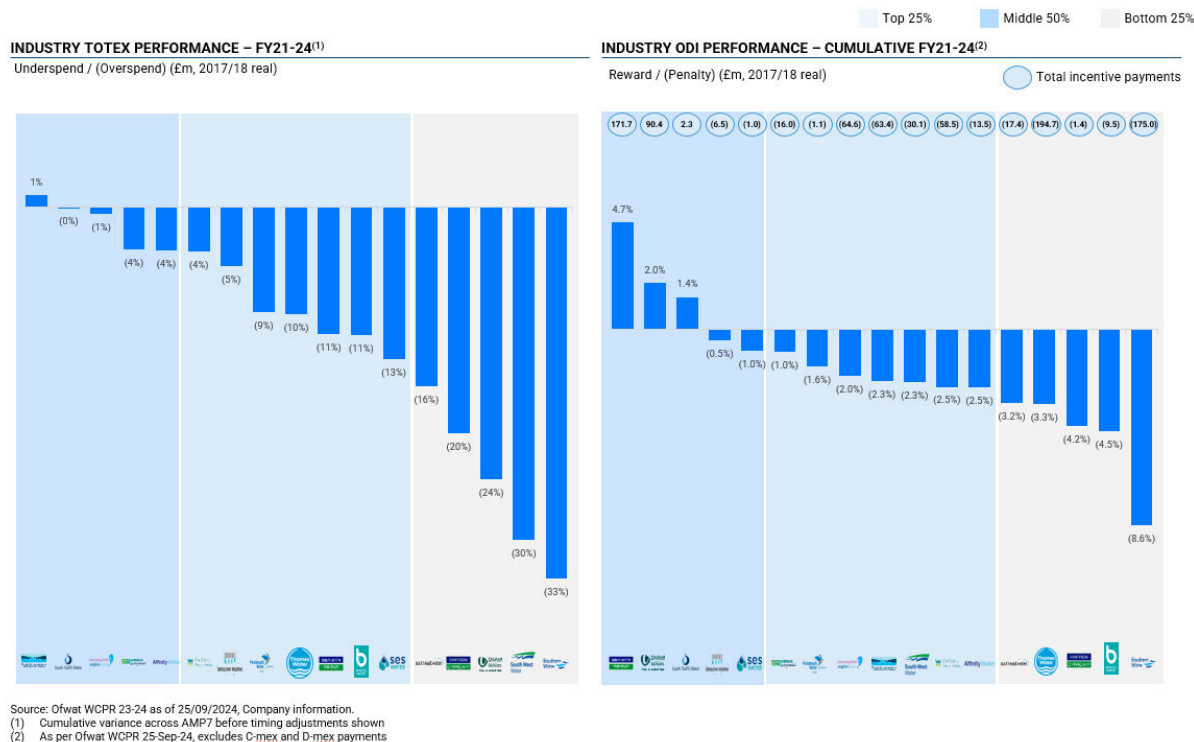
- (a) Non-delivery PCDs (which despite their name are really a cliff-edge incentive around timing rather than non-delivery *per se*) are downside only. Ofwat believes that about 24% of projects are delivered late, varying from 22% for supply schemes to 36% for metering (*Ibid.*, §4.7.2). Yet the base case in Ofwat's modelling – i.e. the case on which permissible levels of return and pricing are calculated – does not assume that any level of non-delivery PCD bites.
- (b) MeXes are a very poor proxy for service quality (even customer service quality) and instead track popularity and perception, factors which it would be extremely difficult to address directly not to mention wasteful (e.g. publicity campaigns trying to make consumers feel better disposed towards their water and sewerage supplier). For some participants, particularly Thames and Southern, low MeX scores have persisted in the face of major investment in customer service and evidence of operational improvement.³ The MeXes reward or punish companies for comparative performance, without reference to their comparative starting positions at the beginning of AMP8. For less popular companies, therefore, MeXes are another measure where: (i) the most realistic expectation is of a penalty; but (ii) the base case modelling by which permitted returns and prices are set does not assume one.
- (c) Past experience confirms the tendency of Ofwat to mis-calibrate the incentive framework. Four years into AMP7, over 80% of the sector received more performance penalties than rewards, with the sector in a net penalty position of £300 million over the first 4/5^{ths} of the period. This is not a result of underinvestment but is despite sector overspend on wholesale costs of £3.6 billion and retail by £600 million over the same time frame.⁴ If, in reality, the majority of an industry is unable to achieve a performance target despite over-spending to achieve it, miscalibration of the targets is a more

³ Thames Water, *Third Party Submission in Response to Disputing Companies' Statements of Case*, 22 April 2025, §6.1 and Annex

⁴ Southern Water *Statement of Case*, pp. 18-19

plausible explanation than widespread idleness, inefficiency or lack of skill. The charts below show AMP7 performance to date on totex and ODIs across the industry.

AMP7 Performance To Date



Issue 5: Modelling for WACC does not reflect water industry reality

42. If the Thames Water redetermination comes before the CMA, it will be necessary to grapple with the question of whether the notionally efficient capital structure approach employed by Ofwat is defensible for a company undergoing restructuring. This submission, however, focuses on inadequacies in the WACC estimation assuming (for present purposes) the correctness of WACC based on a notionally efficient capital structure.
43. Such a capital structure must, however, be notional rather than fantastical. It sets aside the effect of individual companies' treasury management activities, dividend policies, equity issuance and historical operational and financial performance. The notional capital structure ought to be one which would *in fact be available* to an industry participant accessing the capital markets as they actually are at the relevant time(s).
44. There have been two principal failures in Ofwat's calculation of notionally efficient WACC. First, there is no appropriate adjustment to beta for the fact that AMP8 will involve an unprecedented step-up in spending amid a complex and downside-heavy incentive

package, which, because of the increased operating leverage flowing from substantially increased fixed costs, entails a radically different risk-profile from earning returns on an existing operational asset base: see §§6, 39-41 above and §6 in the Compass report. In contrast, Ofwat's beta is based on historical observation of two out of the three listed UK water companies, during prior periods with much lower investment.⁵

45. Second, Ofwat uses a cost of debt which fails to account sufficiently for the UK water industry risk premium which has emerged in the period since Thames Water was widely reported to be financially distressed. Data show that recent UK water bond issuances have exhibited a yield premium even though the issuers were not themselves in financial distress. KPMG's data shows that in the period since June 2023, 22 out of 26 bonds issued by the UK water industry have had a yield at issue of at least 10 bps above the relevant index. In the same period, no water bonds have been issued at a material discount to the index. The average premium across the 26 data points is 50bps. This contrasts with the period prior to June 2023, when premia and discounts were modest and appear to have been roughly zero mean: see *Estimating the Cost of Capital for PR24*, figure 31 page 124.
46. Ofwat's approach in setting the allowed cost of new debt is to apply a 30bps premium to the index '*to reflect sector-wide increases experienced by water companies in 2024 and to support companies to raise increasing levels of finance in international markets*': see *PR24 Final Determinations: Aligning risk and return*, §4.3. This approach falls short of the presently observed premium by 20bps and, perhaps more importantly, fails to deal with the very real possibility that the industry premium will significantly expand depending on the course of the Thames Water restructuring.
47. In the redeterminations, the CMA will need to choose a cost of debt which reflects not only present market conditions but also a reasonable estimation of how conditions might develop over AMP8 (given capital is likely to be raised throughout). There is a non-zero risk that Thames Water creditors face a larger haircut than the market currently expects. Any decisions by the CMA on cost of debt will need to consider the sector-wide

⁵ While the exclusion of Pennon might previously have been justified on the grounds that it represented an interest in both SWW and Viridor (an unregulated waste transfer business), this explanation has not been relevant since the sale of Viridor in July 2020. Given that Pennon has continued to have a higher beta than its two listed peers, its unaccountable exclusion is a further reason that Ofwat's beta is understated.

ramifications of a greater than expected creditor write down for the industry's single largest company.

Conclusions

48. If Thames Water's determination comes before the CMA in due course, the Investor Group reserves the right to make further submissions. For present purposes, however, five cross-cutting issues have been identified above, which require the following approach from the CMA in dealing with the several redeterminations:

- (a) Issue 1: There must be adequate, timely and accurately calibrated true-up mechanisms to deal with industry costs inflation driven by the unprecedented level of investment in AMP8. The unevidenced frontier shift should be abandoned. The incentive mechanisms (if they are to be retained) must be calibrated so as to avoid leading to demand inelasticity and the creation or aggravation of supply shortages.
- (b) Issue 2: Efficiency challenges based purely on benchmarking company costs against one another should be restricted to cases where there is a high level of confidence in inter-company comparability. The same applies to project cost challenge based on historical data: the utility of such past data to project future costs given the project attributes must first be substantiated.
- (c) Issue 3: Econometric modelling should only be employed where it can be done satisfactorily, i.e. with reasonable evidential basis, theoretical defensibility and predictive accuracy. If econometric modelling cannot meet this standard, it should be abandoned and replaced by detailed cost scrutiny on a per-company/project basis.
- (d) Issue 4: Overlap in different incentive mechanisms should be removed and the scheme of incentives radically simplified and de-duplicated to avoid 'wicked' problems. Incentives should be calibrated for each company to provide, in expectation, a reasonable (and reasonably symmetrical) spread of results around the model base case, which itself should be reasonable in view of each company's characteristics.
- (e) Issue 5: WACC should be adjusted to reflect: (i) the fact that forward-looking beta is likely to exceed the average of past data; and (ii) both observed and potential industry risk premia associated with contagion from financially distressed companies.

THOMAS DE LA MARE KC
DOMINIC HOWELLS

Blackstone Chambers
April 2025