APPENDIX SES005

EXPLAINING OUR COSTS

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APPENDIX SES005

A. WHAT BASE BUYS

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APPENDIX SES005: WHAT BASE BUYS

Ofwat has challenged all companies to establish the level of performance that can be delivered under each PCL by ‘base expenditure’ over AMP8 and over the Long-Term Delivery Strategy (LTDS) period. This appendix outlines our technical approach to addressing this question.

A. Introduction

1. This appendix sets out the technical approach that SES has taken to establish “What Base Buys” – the level of PCL performance that we expect to deliver from base expenditure over AMP8 and the Long-Term Delivery Strategy (LTDS) period.
2. Ofwat has not provided companies with firm methodological guidance on how to forecast ‘What Base Buys’ at PR24. For example, companies have not been given any guidance on how to treat potential interactions with the frontier shift targets applied to future expenditure, or time lags between investment and performance improvements within their What Base Buys submission. As a result, we have taken a pragmatic approach which we believe meets Ofwat’s objective of understanding the level of performance that we consider can be delivered by base expenditure over time.
3. Two broad methodologies were considered:
   - **(a)** **Top-down:** The level of performance that can be delivered from base expenditure is estimated by attempting to identify a statistical relationship between expenditure funded through Ofwat’s base cost modelling and PCL performance.
   - **(b)** **Bottom-up:** Expert judgement is used to define the impact of each activity included within our core delivery pathway on PCL performance. This will account for the specific circumstance and opportunities in the SES business.
4. While these approaches are not mutually exclusive, we have adopted a bottom-up approach to forecasting What Base Buys for PR24. This choice is based on concerns around the validity and robustness of using any perceived statistical relationship between base expenditure and performance as the basis for forecasting future What Base Buys.
5. As outlined in subsequent sections, the relationship between expenditure and performance is complex given the presence of a range of uncertainties and external factors. Below we set out some of the challenges involved with identifying the level of performance that can be delivered from base expenditure and then outline the bottom-up approach we developed to forecast What Base Buys over AMP8 and the LTDS and a summary of the proposals we have made in our business plan.

Document structure

6. The rest of this appendix is structured as follows:

- <u>Part B</u> outlines a range of conceptual and practical challenges that we have identified with forecasting ‘What Base Buys’.
- <u>Part C</u> outlines the approach we developed to define the level of performance improvement that may be deliverable from base expenditure.

- Part D illustrates the expected level of performance improvements that is delivered from base expenditure in our LTDS and business plan.

B. Challenges with forecasting What Base Buys

7. Forecasting the level of performance that will be delivered from base expenditure over the period from AMP8 to AMP12 poses two key conceptual challenges:
   - **(a)** First, companies must define what constitutes base expenditure on a forward-looking basis over the LTDS period. This definition is subject to the inherent uncertainty involved with identifying what new investments will be needed across multiple price controls. It is also subject to uncertainty surrounding the definition and treatment of base expenditure in the future.
   - **(b)** Second, companies are required to forecast the level of performance that will be delivered by base expenditure over time. Identifying the level of performance that is delivered from base expenditure raises a range of practical challenges.
8. The following sections discusses each challenge in turn.

Base expenditure

9. By the definitions set out in Ofwat's PR24 guidance documents, all expenditure included within our PR24 Business Plan and our LTDS must be necessarily categorised as either 'base expenditure' or 'enhancement expenditure'. The first challenge involved with forecasting 'What Base Buys' therefore lies in first forecasting what expenditure falls within each category.
10. Ofwat's LTDS guidance[1] sets out principles for how companies should think about this distinction:
    - **(a)** *"Base expenditure: routine, year-on-year costs, which companies incur in the normal running of their businesses to provide a base level of good services to customers and the environment and maintain the long-term capability of assets."*
    - **(b)** *"Enhancement expenditure: generally, investment to achieve a permanent increase or step change in the current level of service to a new 'base' level and/or the provision to new customers of the current service. Enhancement funding can be for environmental improvements required to meet new statutory obligations, improving service quality and resilience, and providing new solutions for water provision in drought conditions."*[2]
11. We have taken this guidance into account in preparing both our PR24 Business Plan and LTDS. While Ofwat's definition explicitly links enhancement expenditure with a permanent increase in performance, it is not the case that Ofwat expect 'base expenditure' to be solely associated with the maintenance of a static performance delivery level.
12. Ofwat has previously taken the view that stretching performance delivery targets set at PR19 could be achieved through a better and more efficient use of existing 'base expenditure'. This view has been confirmed by Ofwat's PR24 LTDS guidance which has explicitly asked companies to deliver performance improvements over the long-term through both their base cost allowances and through ongoing technological improvements.
13. Companies are accordingly required to develop a view of what constitutes 'base expenditure' which is consistent with these definitions and with other parts of the PR24 price control (e.g., with Ofwat's base cost modelling and frontier shift challenge).

[1] Ofwat (April 2023) PR24 and Beyond: Final Guidance on Long Term Delivery Strategies.
[2] Ibid., p. 12

14. For our PR24 Business Plan, we have benchmarked our ongoing base costs (using Ofwat's industry datasets) and have submitted a series of well justified enhancement claims (that include CAPEX and incremental OPEX) to support our forecast step change in performance levels in AMP8.
15. For the purposes of preparing the LTDS[3], we have adopted the following principles and approach to defining base and enhancement expenditure.
    - **(a)** We assume the investment we need to undertake beyond AMP8 to support the resilience of our business and future step changes in performance – i.e., over and above the performance improvements we expect to achieve from our forecast ongoing base costs – is reported as enhancement expenditure.
    - **(b)** We have then assumed the ongoing expenditure that is required to maintain this new base level of performance – and the long-term capability of our invested asset base – in subsequent AMPs will become part of our base cost; that is, the reported enhancement expenditure in our LTDS tables excludes the incremental expenditure in subsequent AMPs to when the enhancement was made, as we have assumed this will be funded as base expenditure.
    - **(c)** We note this forecasting assumption on the split of base and enhancement is premised on Ofwat's base cost modelling adequately reflecting over time, the ongoing costs SES Water and other companies incur as we invest in the capability of our assets and future step changes in performance levels.

Forecasting a level of performance from base expenditure

16. As set out in the CMA's final decision on PR19, there is no simple cost-service relationship in the water sector.[4] Identifying the level of performance that is delivered from 'base expenditure' over a 25-year time horizon therefore raises a range of practical challenges.
17. For example, the relationship between expenditure and performance within the water sector is unlikely to be linear while a wide range of external factors will also impact on the level of performance. We outline some of these challenges in Table 1 below.

Table 1: Challenges in forecasting What Base Buys over the LTDS

Challenge	Description
Exogenous factors	The level of performance that is deliverable from base expenditure is complicated by the many exogenous factors that can impact on both costs and service levels. New investment and/or continued performance improvements from base expenditure will be needed to counter the growing prevalence of extreme weather conditions that impact the level of service we offer at times. Wider external changes in Government policy, demographics, economics, and consumer engagement with the water sector can all also impact on performance for the better or worse even while holding a level of expenditure constant.

[3] See Section 4 (paragraphs 31 – 35) of our LTDS and the supporting appendix on how we approached the development of the LTDS.
[4] CMA (2021) Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, p626-631.

Challenge	Description
Interactions between base and enhancement	The level of performance delivered from 'base expenditure' at any given point in time will be influenced by the level of funding allocated to enhancement. For example, the roll-out of smart meters (an enhancement) will over time enable higher levels of performance to be delivered through 'base expenditure' and a single enhancement case may also impact the levels of performance that can be achieved through base expenditure across multiple performance commitments, e.g., smart metering is expected to have a positive impact on PCC, leakage, etc. The logic also applies to enhancement claims that have been successful in the past. Companies which have already received enhancement claims may be able to deliver a higher level of performance from a given level of base expenditure relative to companies which have not been funded for and delivered the same level of enhancement.
Interactions with Frontier Shift	Ofwat has asked companies to deliver an ongoing efficiency improvement that drives a reduction in base cost over time. This requirement raises a material dual challenge for companies. For example, an independent consulting report commissioned by a consortium of water companies has outlined how the requirement on companies to deliver ongoing service delivery improvements within their PR24 business plans represent another efficiency challenge.[5]
Time lag between investment and performance	The long-lived nature of network assets operated by SES Water adds complexity to the intertemporal relationship between expenditure and performance. For example, the introduction of smart meters may have a lagged impact on some performance outcomes due to the time it takes for behavioural change to take root.

Source: SES Water analysis

18. Noting the range of challenges discussed in Table 1, together with the quality and consistency of data that is currently available to us, we did not consider that a top-down approach to identifying What Base Buys that relies on identifying a statistical relationship between performance and expenditure funded through Ofwat's base cost modelling would provide us with a reliable approach to forecasting 'What Base Buys' over AMP8 and over the period of the LTDS.
19. Instead, we have developed a bottom-up approach to estimating What Base Buys that is informed by expert judgement on the level of performance for each PC that will be delivered by each activity over AMP8 and over the LTDS.
20. This bottom-up approach is outlined in detail below and has the key advantage that it ensures we are appropriately reflecting the specific opportunities for performance improvements in base that are achievable within the context of our business and the core pathway that we have identified through our LTDS modelling.

[5] Economic Insight (2023) Productivity and Frontier Shift at PR24.

C. Approach to forecasting What Base Buys

21. This section sets out the bottom-up approach that we have used to forecast the level of performance that will be delivered by base expenditure ("What Base Buys") over AMP8 and the LTDS period.

22. Our approach is based on developing a disaggregated view of What Base Buys using a three-step process:

    (a) **Step 1 – Forecast our long-term performance ambition and delivery.**

      (i) For the core pathway, we forecast the total performance ambition for each PC between AMP8 and AMP12.

      (ii) We define each activity included within the core pathway (derived from our LTDS and Copperleaf modelling) as base or enhancement expenditure.

      (iii) We identify which activities are expected to contribute to performance in future AMPs by PC.

    (b) **Step 2 – Forecast the level of performance that will be delivered from core activities.**

      (i) We attribute a level of performance improvement in each AMP to individual activities that are included in our core pathway.

      (ii) We sum the level of performance that is delivered by each activity included in the core pathway to develop a view on the total level of performance that is delivered by base or enhancement expenditure.

    (c) **Step 3 – Any 'residual' performance which is not attributed under Step 2 is apportioned between base and enhancement using a simple decision rule.**

      (i) If the bottom-up process of forecasting performance from individual core activities does not match the level of performance ambition for each PC (i.e., if there is a "residual" level of unexplained performance remaining after Step 2) we apply a simple decision rule to apportion this performance level to base expenditure or enhancement expenditure.

      (ii) Residual performance is apportioned between base expenditure or enhancement expenditure based on the split in cumulative TOTEX between those activities that are expected to contribute to PC performance improvements, but which have not had a level of performance improvement established under Step 2.

23. Each step is outlined in further detail below.

Step 1: Forecast our long-term performance ambition and delivery

24. In this step we first forecast the level of performance that we aim to deliver under each PC. We have challenged ourselves to develop a set of stretching PCs for the period covered by AMP8 and by the LTDS. Our approach to developing each PC target is described in detail within Chapter 6 – The Outcomes We Will Deliver of our PR24 Business Plan. These targets are also summarised in Table 2 below.

Table 2: Proposed Performance Commitment Levels between AMP8 and AMP12

PC over the LTDS	Units	AMP8					AMP9	AMP10	AMP11	AMP12
		25/26	26/27	27/28	28/29	29/30	34/35	39/40	44/45	49/50
WSI	Minutes per property	00:03:50	00:03:45	00:03:40	00:03:35	00:03:30	00:03:00	00:01:45	00:01:00	00:00:00
Leakage	% reduction from 2019/20	-15.5%	-18.3%	-21.0%	-23.8%	-26.6%	-38.1%	-47.2%	-55.4%	-62.5%
PCC	% reduction from 2019/20	-6.6%	-7.9%	-9.0%	-10.0%	-11.0%	-16.0%	-20.5%	-23.1%	-25.7%
Mains Repairs	# repairs / 1000 km of mains	58	57	56	55	54	48	43	38	34
Unplanned Outages	% of p/w production.	1.0%	1.0%	1.0%	1.0%	1.0%	0.8%	0.5%	0.3%	0.0%
GHG Emissions	Kg CO2e/ML	345.6	341.7	341.2	340.6	339.7	328.4	327.5	324.9	322.2
Customer Contacts	# contacts / 1000 people	0.60	0.60	0.60	0.60	0.60	0.53	0.48	0.40	0.33
Business Demand	% reduction from 2019/20	-4.7%	-3.4%	-4.0%	-4.5%	-5.1%	-8.1%	-11.0%	-13.9%	-16.9%
Biodiversity	Net change in biodiversity / $100km^2$	0	0	0	2	3	4	58	64	64
Serious Pollution Inc.	# of incidents	0	0	0	0	0	0	0	0	0
Discharge permit Com.	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance Risk Index	Index score	0	0	0	0	0	0	0	0	0
Softening	Deviations from target	0	0	0	0	0	0	0	0	0

Source: SES Water analysis

25. To deliver on the level of ambition outlined in Table 2 above, we have developed a core delivery pathway. Each pathway consists of a series of activities which we will need to deliver in order to meet the level of performance ambition that is proposed for each PC.

26. In order to map how these activities relate to the performance ambition shown in Table 2 above, we used our 'What Base Buys' MS Excel tool to categorise all core pathway activities included as follows:

    (a) We identify whether each core activity should be classified as base or enhancement expenditure. This process involved a careful review of each activity within the context of how base and enhancement expenditure is defined.

    (b) We identify what PCs that activity is likely to impact on. This step recognises that some activities within the core pathway may impact on performance for more than one PC at the same time.

27. An illustration of this categorisation is shown in the table below.

Table 3: Illustration of how each activity is categorised under Step 1.

Category	Description
Activity	Enhanced smart metering programme.
Pathway	Core.
Costs in AMP8	£22.3 million (2022/23 prices) in TOTEX.(pre OE challenge)
Base or enhancement	Enhancement.
PCs related to this activity	This activity is expected to impact on performance across multiple PCs: • Business Demand • Customer Contacts about Water Quality • Per Capita Consumption • Leakage • Water Supply Interruptions

Source: SES Water

28. Categorising each activity in the same manner within the Excel tool provides us with a clear view of what base and what enhancement activities are expected to be responsible for delivering on the level of performance ambition under each PC.

Step 2: Forecast the level of performance that will be delivered from core activities

29. This step is based on the use of expert judgement to forecast what impact an individual activity will have on performance levels. This step involves taking a bottom-up view of the performance benefits that will be delivered from all base and enhancement investment areas. To illustrate this step, we show how the Enhanced Smart Metering Programme is expected to impact on performance by the end of each AMP in Table 4 below.

Table 4: Improvement in performance that is delivered by the Enhanced Smart Metering Programme by the end of each AMP period (AMP8 to AMP12)

PC	Units	AMP8	AMP9	AMP10	AMP11	AMP12
Expenditure						
Enhanced Smart Metering	£m	22.28	9.73	9.44	11.01	11.01
Change in performance level as a result of this expenditure						
Per Capita Consumption	litres / person / day	-4.84	-6.63	-6.49	-6.29	-6.07
Leakage	Ml / day	-0.25	-0.50	-0.50	-0.50	-0.50
Business Demand	Ml / day	-0.82	-1.14	-1.14	-1.14	-1.14
Customer Contacts about Water Quality	# contacts / 1000 people	-	+0.02	+0.02	+0.02	+0.02
Water Supply Interruptions	Minutes per property	-	+00:00:01	+00:00:02	+00:00:02	+00:00:02

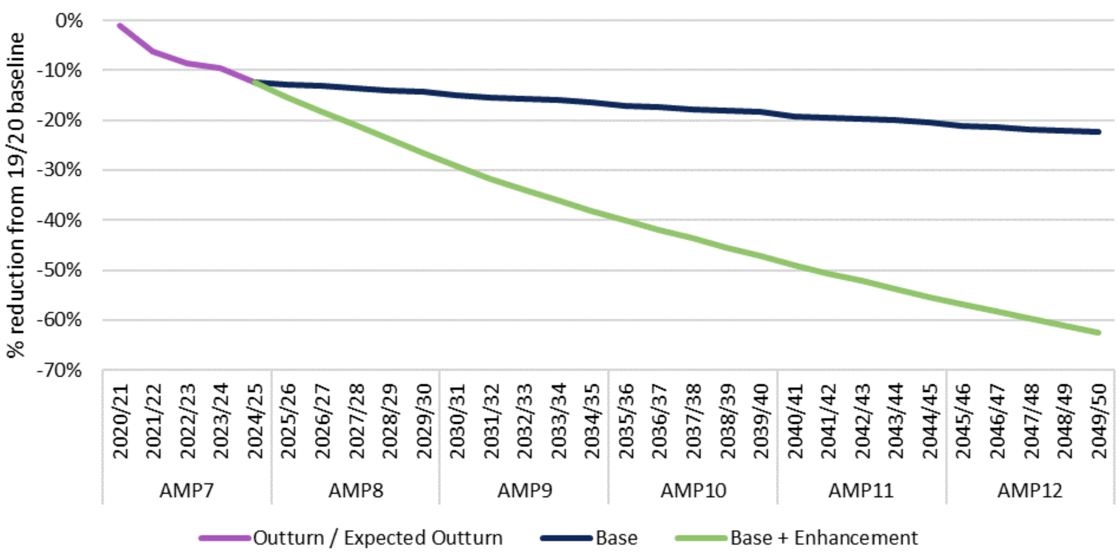
Source: SES Water

30. Table 4 shows that the delivery of our Enhanced Smart Metering programme is expected to reduce Per Capita Consumption (PCC) by 4.84 litres per person per day, reduce leakage by 0.25 Ml per day, and Business Demand by 0.82 ML per day over AMP8.

31. By repeating this process in our What Base Buys MS Excel tool for the activities included in the core pathway, we have built a bottom-up view of the level of performance for each PC that is delivered from base expenditure and enhancement expenditure.

32. An illustration of the expected Leakage performance that is delivered from base and enhancement expenditure is illustrated in Figure 1 below. The figure shows that base expenditure is forecast to deliver significant improvements in leakage performance over the 2025-50 period. However, the figure also shows that the most significant changes in leakage performance will be delivered by enhancement.

Figure 1: Leakage performance improvement delivered by base and enhancement.



Source: SES Water analysis

33. In some limited cases, we are unable to accurately attribute the full level of performance that we are targeting to deliver under each PC to individual base and enhancement activities. For example, it is difficult to attribute performance impacts to individual activities in cases where there are a large number of small activities that are expected to collectively contribute to a PC outcome level. The approach to dealing with this "residual" performance level is outlined in Step 3 below.

Step 3: Attribute any residual performance improvement to base and enhancement expenditure based on the split in cumulative TOTEX for those expenditure items that are relevant to that PC

34. This step is applied as a simplifying assumption in cases where:

  (a) We are unable to robustly attribute a performance impact to an individual activity that is included in our core pathway (i.e., due to uncertainty over the likely impact); and

  (b) Where the total level of performance attributed under Step 2 under a given PC differs from the performance level shown in Table 2.

35. In practice, both criteria apply for just the CCAWQ PC. All other performance for all other PCs is apportioned on a bottom-up basis under Step 2. Where a 'residual' level of

performance improvement does exist (i.e., for CCAWG), this has been apportioned in our modelling between base and enhancement expenditure based on the split in cumulative TOTEX for all those activities that are deemed to be relevant to that PC under Step 1 but do not have a specific level of performance improvement attributed to them under Step 2.

36. We recognise that this approach is a simple approximation and that performance in practice will not linearly relate to the share of TOTEX expenditure that is base and enhancement. However, we consider that this is an appropriate and pragmatic approach given the high level of uncertainty around the drivers of performance from base expenditure over time and the limited case in which it has been applied.

D. What Base Buys

37. We have forecast the level of performance that can be delivered by base expenditure for each PC ("What Base Buys") using the disaggregated bottom-up approach set out above in this appendix. A summary of the forecast for What Base Buys for each PC is shown below (consistent with Data Table LS2).

Table 7: What Base Buys between AMP8 and AMP12

PCs	Units	AMP8					AMP9	AMP10	AMP11	AMP12
		25/26	26/27	27/28	28/29	29/30	34/35	39/40	44/45	49/50
WSI	Minutes per property	00:03:54	00:03:51	00:03:48	00:03:45	00:03:41	00:03:31	00:02:29	00:01:58	00:00:59
Leakage	% reduction from 2019/20	-12.8%	-13.2%	-13.6%	-14.0%	-14.4%	-16.4%	-18.4%	-20.3%	-22.3%
PCC	% reduction from 2019/20	-4.2%	-4.5%	-4.8%	-5.0%	-5.2%	-6.9%	-8.2%	-9.2%	-10.2%
Mains Repairs	# repairs / 1000 km of mains	58.5	58.0	57.5	57.0	56.5	54.0	51.5	49.0	46.5
Unplanned Outages	% of p/w production.	1.13%	1.13%	1.13%	1.13%	1.13%	1.01%	0.76%	0.51%	0.26%
GHG Emissions	Kg CO2e/ML	346.8	344.4	344.4	343.9	343.0	337.4	337.2	334.9	332.5
Customer Contacts	# contacts / 1000 people	0.60	0.60	0.60	0.60	0.60	0.55	0.52	0.46	0.40
Business Demand	% reduction from 2019/20	-2.9%	-2.0%	-2.3%	-2.6%	-2.8%	-4.6%	-6.9%	-9.3%	-11.8%
Biodiversity	Net change in biodiversity / 100km^2	0.00	0.00	1.73	2.49	2.49	2.97	46.67	51.19	51.19
Serious Pollution Inc.	# of incidents	0	0	0	0	0	0	0	0	0
Discharge permit Com.	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance Risk Index	Index score	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Softening	Deviations from target	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: SES Water analysis

APPENDIX SES005

B. COST EFFICIENCY BENCHMARKING

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SES005B: COST BENCHMARKING

This appendix provides further detail on the benchmarking that we have undertaken to test the efficiency of our current wholesale and retail base expenditure and our planned base expenditure over AMP8. We also document our analysis of the scope for ongoing efficiency and our assumptions of input price inflation pressures in AMP8.

A. Introduction and overview

1. This appendix provides further detail on the benchmarking and analysis we have undertaken to test the efficiency of our business plan base cost forecasts. We include our analysis of the scope for ongoing efficiency and input price inflation.
2. Section B and C respectively set out the analysis we have undertaken to benchmark our historic and forecast wholesale base costs. Section D summarises our analysis to test the efficiency of retail expenditure plans, while Section E sets out the practical measures that we will take to ensure the efficiency of our expenditure in AMP8. This appendix should be read alongside our base cost adjustment claims that are provided in Appendices SES027-SES030 to our business plan.
3. We have tested the efficiency of our current and forecast costs using Ofwat's published wholesale and retail base cost models, alongside a series of well evidenced cost adjustment claims, and assumptions of the impacts of input price inflation pressures and scope for ongoing efficiencies in the next AMP on our efficient costs.
4. As we outline in this appendix, we have some concerns with aspects of Ofwat's proposed base cost models for both wholesale and retail – issues we believe Ofwat will need to consider carefully and address as parts of its PR24 determinations. Nevertheless, consistent with Ofwat's guidance we have sought to build upon its consulted models and suggest changes and adjustments, and ways to interpret the results from Ofwat's models, to robustly test the efficiency of our expenditure plans.
5. Overall, our analysis shows:
    - Once our cost adjustment claims to Ofwat's cost modelling are accounted for, our wholesale business costs are consistent with an **upper quartile efficiency benchmark** in the last outturn year of the current AMP (2022/23).
    - Our plan **will continue to target upper quartile level efficiency for our wholesale business in AMP8** once our cost adjustment claims, recent and future cost trends and scope for ongoing efficiencies are accounted for.
    - The efficiency of our retail business has been improving in the current AMP and we project our **retail costs to be consistent with an upper quartile efficiency benchmark** by AMP8 although we continue to have some concerns whether Ofwat's retail cost models are sufficiently robust to justify the application of an upper quartile efficiency benchmark.[1]

[1] For the reasons we set out in Section D, we consider a less stringent benchmark is consistent with the diagnostics of Ofwat's cost models and also an appropriate efficiency benchmark for our retail business in light of Ofwat's modelling framework and the transformational journey of our retail business to support the ambitious outcomes proposed in our business plan.

B. Benchmarking our historic wholesale base costs

We have benchmarked our outturn wholesale base expenditure over AMP7 against an upper quartile efficiency benchmark. We exclude cost items that sit outside the benchmark models, such as the costs associated with our softening obligations, local authority rates, etc.

Through this exercise, we find that our expenditure for the first three years of AMP7, including 2022-23, are efficient on an upper quartile basis. This is despite additional capital investment to ensure we continue to deliver the performance our customers expect.

6. In this section we set out the benchmarking we have undertaken of our historic wholesale base costs, applying an upper quartile efficiency benchmark.
7. To compare our outturn modelled expenditure with an upper-quartile efficient estimate, we begin with the 24 base cost models published by Ofwat in its April 2023 base cost consultation. We consider some of these models are more suitable for determining efficient costs than others, as we discuss further later in this section.
8. We adjust the upper quartile estimate of efficient expenditure from Ofwat's models to account for several factors that are not captured within the models. These are:
   - **(a)** Real price increases that the industry has experienced in recent years that are not captured in Ofwat's benchmarking models, particularly, energy and chemicals costs.
   - **(b)** Our cost adjustment claim for higher pumping costs due to our network topology. The size of our claim is dependent on the models chosen by Ofwat – if Ofwat were to select models that include Average Pumping Head (APH) as a variable, the size of our claim would reduce accordingly.
   - **(c)** A new company-specific cost adjustment claim we have submitted for higher regional wages, drawing on the claims submitted by Affinity Water and Southern Water.
9. We compare this adjusted upper quartile efficient estimate against our outturn expenditure in AMP7 to draw conclusions of the efficiency of our current costs.

Our view of Ofwat's benchmarking models

10. Ofwat's base cost modelling consultation, published on 5th April, included 24 econometric benchmarking models. Half of these models are top-down, estimating total wholesale water base expenditure using a series of cost drivers. The remaining models are bottom-up, with six of the models estimating water resources plus expenditure and the remaining six models estimating treated water distribution expenditure.[2]
11. In general, the models proposed by Ofwat account for a reasonable proportion of variation in total costs and include coefficients that are plausible in direction, magnitude, and significance. This, however, masks significant variations in model results between the various models. In some cases, this variation is directly attributable to the exclusion (or only partial inclusion) of important explanatory variables, as we discuss subsequently. In other cases, it is harder to reconcile.

[2] Wholesale Water base expenditure is split by Ofwat into four components:

Wholesale Water (WW) = Water Resources (WR) + Raw Water Distribution (RWD) + Water Treatment (WT) + Treated Water Distribution (TWD)

For the bottom-up base cost models, expenditure on WR, RWD, and WT have been combined into Water Resources Plus, while expenditure on TWD has been estimated separately.

12. As a small water only company (WoC) with some distinctive and unique operating conditions, we are particularly sensitive to a small number of modelling decisions in Ofwat's benchmarking. While we recognise the value in triangulating across a range of benchmarking models, we have significant concerns with some of the models that exclude key explanatory variables. Including such models in any triangulation exercise is likely to present a distorted assessment and view of our relative efficiency.
13. We have four material concerns with Ofwat's published models, detailed below:
    - (a) **The models do not adequately capture pumping costs related to differences in network topography.** This is because explanatory variables for pumping requirements are either excluded from certain models (i.e. the Water Resources Plus models) or inappropriately proxied using other explanatory variables (i.e. number of boosters per km of mains in the Treated Water Distribution and top-down Wholesale Water models). Our view is that APH is the more appropriate explanatory variable for differences in network topography, having a stronger engineering rationale than alternatives.
    - (b) **The models do not capture recent external input price pressures.** The approach taken by Ofwat in its base cost models implicitly assume that input costs move in tandem with general price inflation. However, energy, chemicals and materials costs have all increased in recent years by more than inflation, in some cases by a significant margin. Any estimate of an efficiency score that relies on data before 2022-23 is unlikely to capture this effect given how significant energy, chemicals and materials cost inflation has been since the second half of 2021.[3]
    - (c) **The models do not capture differences in wages between different regions.** Our technical labour costs are based on prevailing labour costs in the south-east England region, a labour market with above average wage rates. While it is claimed that differences in regional wages are proxied through the inclusion of a density cost driver, we find that this does not fully capture our exposure to higher regional wages.
    - (d) **The models exhibit a degree of temporal autocorrelation as we, and others, have highlighted in previous engagement with Ofwat.** This makes the models less efficient, an issue that is likely to be exacerbated by recent increases in input prices, which have led to an industry wide trend to higher expenditure. In our submission on suggestions for the PR24 models, we proposed including a lagged dependent variable to account for such autocorrelation. We would also encourage Ofwat to consider including an energy price index as an additional cost driver, which may resolve the autocorrelation problem.
14. Many of these are industry-wide issues and include an element of symmetry. As such, it is most appropriate to resolve these issues through adjustments to the models or through industry-wide post-modelling adjustments, wherever possible, rather than through company-specific cost adjustment claims. Below, we include a discussion of how these adjustments could be captured within the models.

Pumping requirements associated with differences in network topography

15. We welcome the inclusion of APH in a subset of the base cost models, namely the Treated Water Distribution models. We also welcome Ofwat's and the industry's considerable work to improve data quality and facilitate the inclusion of APH.
16. It is important to recognise that the inclusion of APH in a sub-set of Treated Water Distribution and Wholesale Water models – and, crucially for SES, its exclusion from

[3] In effect, Ofwat's models do not adequately account for the level of real prices that would reasonably be expected to impact efficient modelled costs in AMP7 and the next AMP.

Water Resources Plus models – fails to fully capture the efficient energy costs of pumping water. In particular:

(a) APH for Treated Water Distribution is not relevant for other parts of the value chain. In water resources, it is the network topography that determines the APH for abstracting water from the ground. This is not the same as pumping the already treated water from a water treatment works to customer properties.

(b) The exclusion of APH from the WRP models means that exogenous variations in the costs of abstracting water from the ground are not accounted for.

(c) The number of booster pumping stations is at best a second-best proxy for pumping need. For PR24, we are in better position to model pumping need than at PR19, thanks to a long time-series available and improvement in APH data quality.

17. We consider the inclusion of booster pumping stations per length of mains in a subset of the models as particularly problematic. In the past, Ofwat has claimed that the inclusion of the number of booster pumping stations within the base cost models, adequately capture the power costs associated with pumping. We do not consider this can be supported from an engineering or technical perspective, or indeed from statistical analysis:

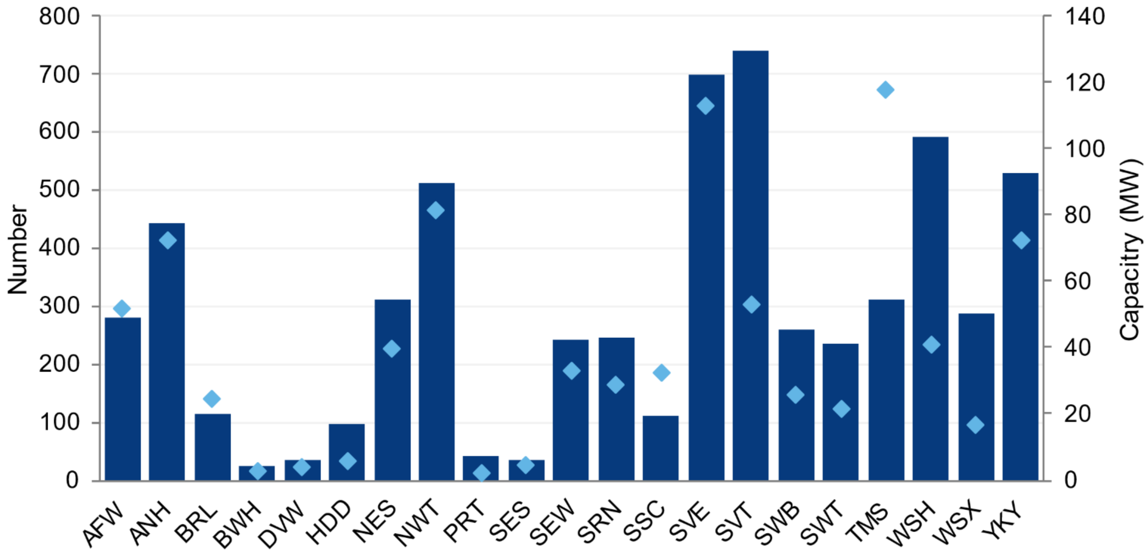
(a) One concerning aspect of its use as an explanatory variable is that it does not necessarily reflect the costs of expanding in scale. If mains length increases below the necessity for building an extra booster pumping station (meaning the number of boosters remains the same while the mains length keeps growing), the value of booster per km of mains will decline – but this should not be taken to mean that the overall cost of operating the network has in fact fallen.

(b) Booster stations come in a wide variety of sizes and capacities. Including the number of stations as an explanatory variable provides no indication of whether they are in use or not, or how much of the capacity is actually put in use, and how much is kept there as reserve (and not consuming energy).

18. Figure 1 below shows the number and capacity of booster pumping stations over the period 2011-12 to 2021-22. This shows there is a relatively random pattern of the relationship between the number and capacity of booster pumping stations.

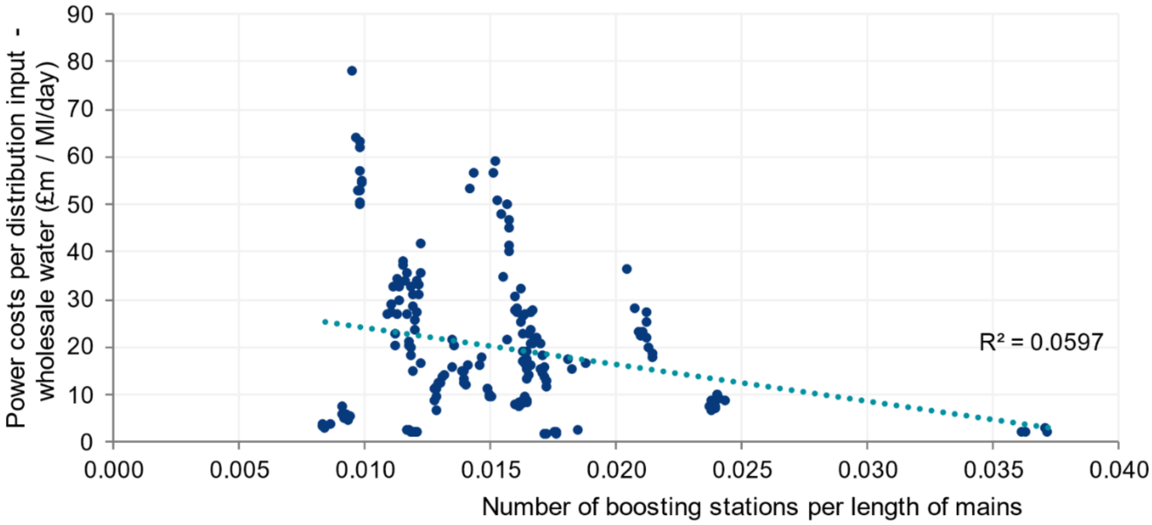
19. Furthermore, as Figure 2 below shows, the number of boosting stations per km is negatively correlated with power costs. This makes the model variable an even less convincing driver of power cost related expenditure.

Figure 1: Number and capacity of booster pumping stations over the period 2011-12 to 2021-22, annual averages



Source: SES Water analysis

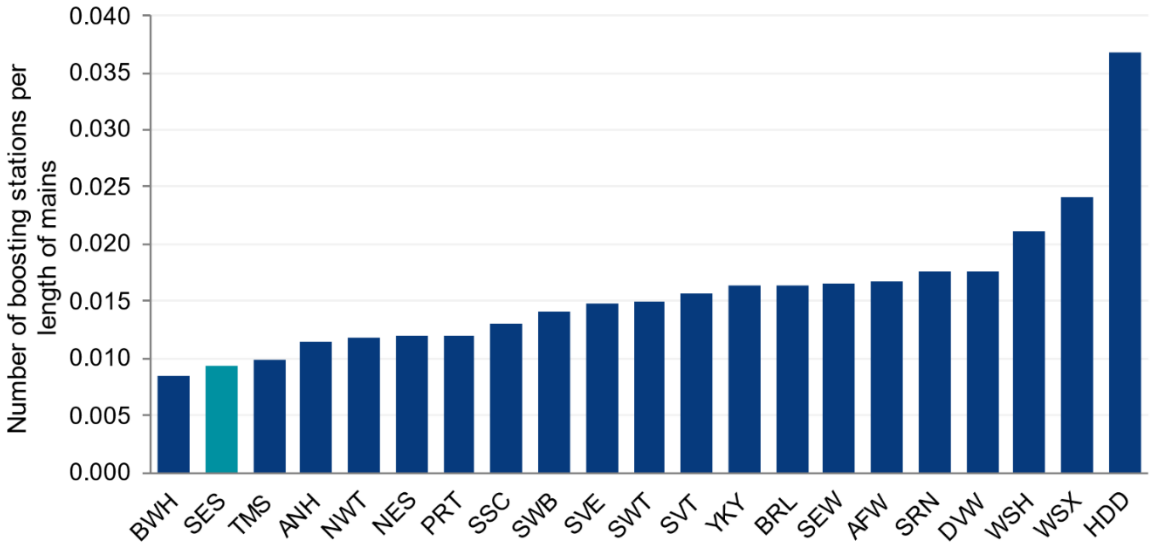
Figure 2: Correlation between number of boosters/km and power cost over the period 2011-12 to 2022-23 (2017-18 prices)



Source: SES Water analysis

20. For SES Water in particular, the presence of number of boosters per km acts as a negative factor to predict power costs, as we have far fewer booster stations than other water companies (as is shown in Figure 3 below). As a result, the inclusion of the variable in Ofwat's base cost models creates an even larger gap between our actual exposure to uncontrollable power costs and Ofwat's modelled power costs.

Figure 3: Average number of booster pumping stations per length of mains over the period 2011-12 to 2022-23



Source: SES Water analysis

21. We recognise the challenges Ofwat has faced in including APH as a cost driver in the water resources plus models, namely the lack of significance in the benchmark models. However, it would be wrong to conclude that this means network topography is not a driver for water resources plus costs. There remains a strong engineering rationale for network topography driving pumping costs for water companies that primarily abstract from groundwater sources. At SES Water, we are particularly exposed to this given our network topography and our reliance on groundwater abstraction. In our cost adjustment claim for pumping costs (see Appendix SES027), we have looked at the relationship between APH and power costs specifically within the water resources and water resources plus price controls. While these are partial models, they lead to a significant and intuitive result, demonstrating the engineering link. Consequently, we consider them an appropriate basis for our cost adjustment claim.

Impact of recent input price pressures

22. Real price effects relate to input prices increasing or decreasing in real terms relative to general consumer price inflation (as measured, for example, by CPIH, which our wholesale base cost allowances are indexed to under Ofwat's PR24 methodology).
23. The Ofwat benchmarking models do not include any explicit adjustment for real price effects over the modelled period. The models do not include any time trends, and costs are deflated using CPIH rather than specific input prices. This means that unless input cost trends are correlated with other variables in the models, all costs are assumed to vary by CPIH over time. It also means that, where input prices do vary differently than CPIH, the implicit price level of those inputs within the base year botex allowances is ambiguous, particularly given the input price pressures experienced in recent years.
24. This ambiguity makes it challenging to determine the point at which real price effects indexation ought to be applied for PR24. In other words, from what year do you apply real price effects indexation to the base cost allowances derived from the benchmarking models? It could be argued to be 2017-18 (as the price base of the base cost data), 2021-22 (as the most recent modelled year), or some alternate price level.
25. To illustrate the challenge:

- While costs have been deflated to 2017-18 prices in the base cost dataset, that does not mean that the modelled costs do not account for any increases in real input prices from 2017-18 onwards. If input price inflation has accelerated over the last few years of the modelled period, which they likely will have once the 2022-23 data is included, it is likely that some of that input price inflation since 2017-18 will be captured within Ofwat's model coefficients.
- Similarly, as the modelled coefficients are based on the whole modelled period, it would be incorrect to assume that the modelled costs for 2021-22 reflect the real price level in 2021-22. In practice, it would reflect the average real price level over the whole modelled period. Given the large increases in real energy, chemicals and materials costs in 2021-22 and 2022-23, this means that applying real price effects adjustments from 2021-22 or 2022-23 could fail to properly capture these increases.
- Finally, the use of efficiency scores from the most recent five years to estimate base cost allowances, may also mean that real input price increases over that period are at least partially captured. However, this is likely to be only a partial adjustment given it is a five-year average.

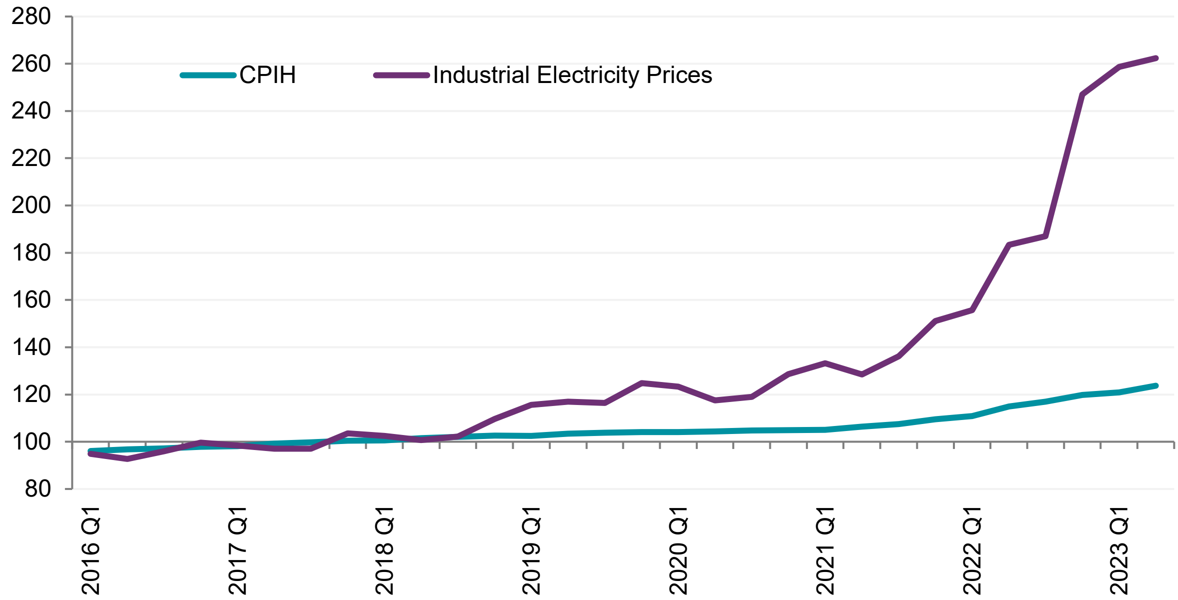
26. Historically, the effect of this inconsistency between the setting of base cost allowances and the application of real price effects indexation may have been immaterial. However, in this case, the multiple causes of upwards pressure to input prices between 2021-22 and 2022-23 mean that the impact is substantial. Without Ofwat accounting for this in its base cost modelling, either through adjustments to the benchmarking models themselves, or through post-modelling adjustments, the industry, and our business specifically, is unlikely to have sufficient funding to maintain our base operations given the cost pressures that we face leading into the AMP.

27. We focus on three specific cost areas:

    (a) **Energy costs**: Wholesale and retail energy costs have increased significantly in recent years across the whole economy. So far, we have been less affected by this than other water companies, due to our energy cost hedges initiated early in AMP7. However, we are expecting a material step-up in our energy costs going into AMP8 as our hedges expire. Reflecting this is important: energy costs account for just over 10% of our cost base.

    We observe from data from DESNZ, that industrial electricity prices have increased by 76% between 2020-21 and 2022-23, as shown in Figure 4. Given the series reflects electricity costs faced by large energy users and takes into account the broad hedging strategies employed by such users, we consider it an appropriate index to account for the water industry's exposure to recent energy price increases, as well as its exposure to future changes in energy costs. While the hedging position of individual firms within the industry will differ, we consider that is for individual firms to manage.

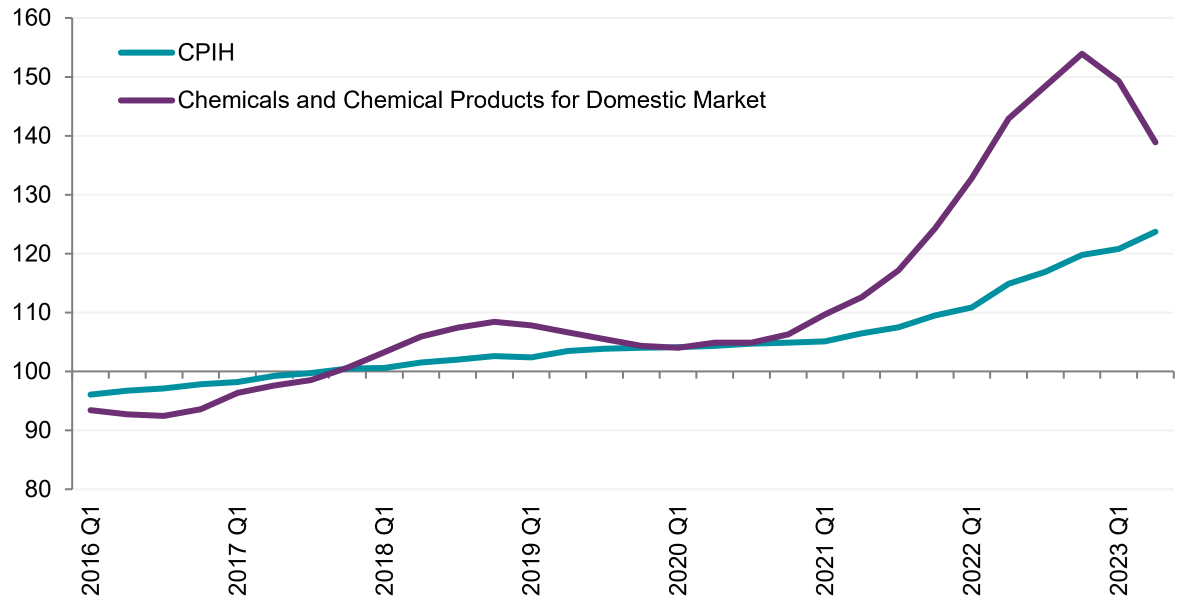
Figure 4: Industrial electricity prices and CPIH, 2017-18 = 100



Source: SES Water analysis of DESNZ and ONS data

(b) **Chemicals costs**: Unlike energy costs, we have been more immediately exposed to increases in prices for chemicals used in our treatment plants. As shown by the ONS Chemicals and Chemical Products Producer Price Index, prices have increased by 40% in nominal terms over the period 2020-21 to 2022-23, as shown in Figure 5. We are also more exposed to higher chemicals costs than some other water companies due to our statutory requirement to soften water for our customers. Excluding softening, chemicals costs account for around 4-5% of our cost base.

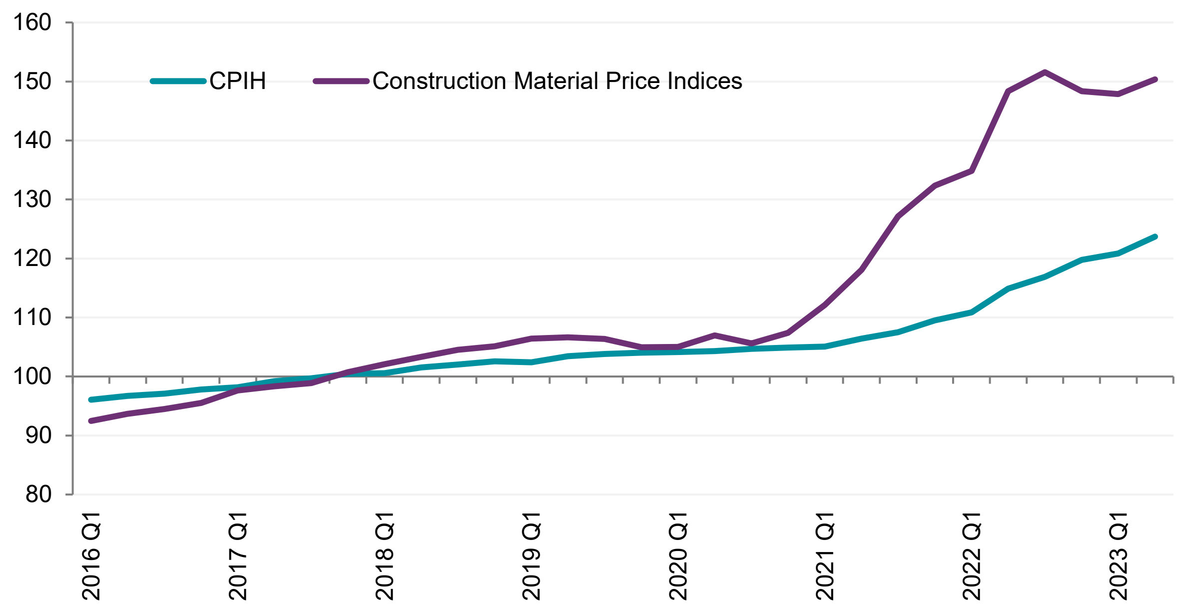
Figure 5: Chemicals and Chemical Products prices and CPIH, 2017-18 = 100



Source: SES Water analysis of ONS data

(c) **Materials costs**: Similarly, the higher costs for construction materials have affected our cost base more immediately. We have experienced a significant increase in the cost of materials for our base capex schemes, consistent with similar trends in other parts of the UK macro-economy (see Figure 6).

Figure 6: Construction materials prices and CPIH, 2019-20 Q1 = 100



Source: DESNEZ & ONS

28. Of the three cost areas, the impact of energy costs is the most significant for the industry driven by the significant volatility and pressures on wholesale prices that has impacted global energy markets since 2021. For that reason, we sought advice from KPMG, in partnership with others in the industry, to understand how to capture the increase in energy costs into PR24 base cost allowances.[4] KPMG identified five approaches:

(a) Inclusion of a cost driver that reflects energy price movements.

(b) Inclusion of a pre-modelling adjustment for power costs based on a relevant price index.

(c) Introducing year dummies to capture time variation effects.

(d) Exclusion of affected years from the sample.

(e) Inclusion of forecast costs in the wholesale base cost econometric models.

29. Our preferred approach is Option (a). We consider one key benefit of this approach is that it is also likely to capture some of the increases in chemicals and materials costs, given that there is a correlation between energy costs and the costs of key chemicals and construction materials. How we have captured this approach in our benchmarking is discussed in further detail below.

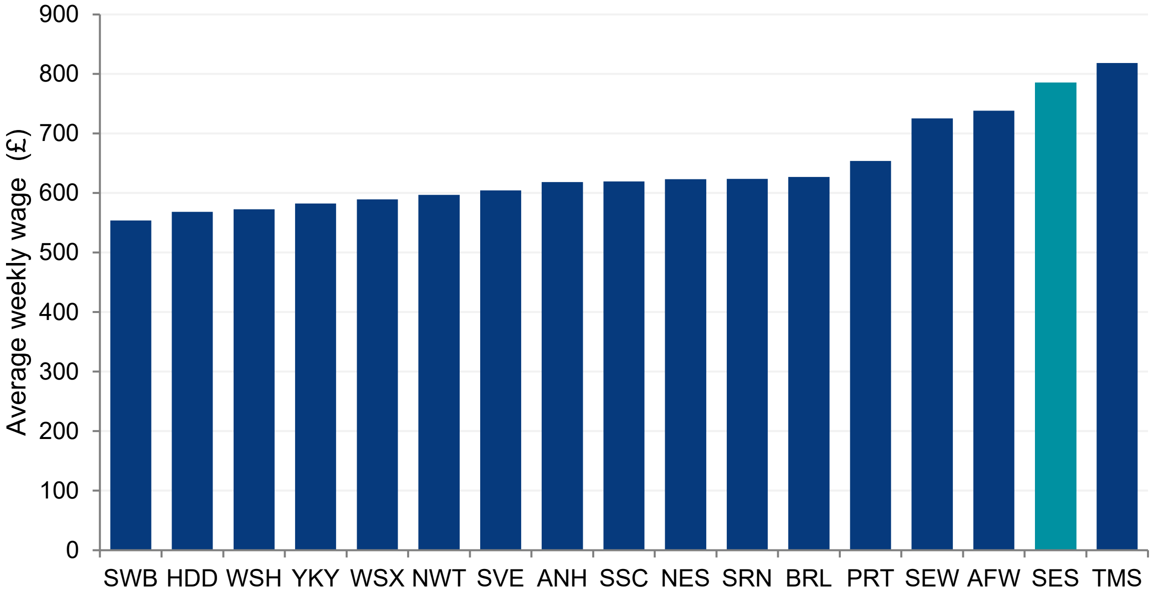
Exposure to higher regional wages

30. Labour costs vary across the UK and are higher in the South East, where SES disproportionately draws its labour. We show this in Figure 7 below. Such higher labour costs are largely outside our control in instances where we must source our labour from

[4] KPMG (2023) Treatment of energy costs in base models

local labour markets. In such instances, labour costs can be considered a valid explanatory variable for the cost models.

Figure 7. Gross weekly wages by company area (£ 2022/23 prices), 2011/12 – 2021/22



Source: SES Water analysis

31. We recognise the complexity of capturing uncontrollable higher labour costs within the benchmark models. Specifically, we recognise that:
    - **(i)** Companies do not necessarily source all their labour locally; particularly outsourced operations may not be subject to higher labour costs.
    - **(ii)** Existing cost drivers may be indirectly capturing the effect of regional wage differences, e.g., the density variable in Ofwat's models.
32. However, while we do have some control over where we source our labour costs, this is not true across all our staffing areas. In particular, our maintenance, capital and operations activities within our wholesale business require labour to be located close to assets. This either means paying regionally applicable wage rates, or ensuring specialist engineering staff travelling from elsewhere within the UK are sufficiently compensated.
33. We consider the density variables in Ofwat's models to not fully capture the impact of regional labour markets on our wage costs. While Ofwat has argued that the density variables capture several uncontrollable drivers of cost, including regional wage rates, and while there is some correlation between density and wage rates, the inclusion of such variables do not fully account for the effect. We demonstrate this in our cost adjustment claim for regional wages as provided in Appendix SES028.

How we benchmark against the industry under Ofwat's published models

34. The wholesale base cost models published by Ofwat in its April 2023 consultation, which are based on data up to 2021-22, show a wide range in our efficiency scores. We show the efficiency scores from these models in Table 1. In the top-down models, our scores range from being 86% less efficient than the upper quartile firm to 5% more efficient than the upper quartile firm.

Table 1: SES Water efficiency ranking based on Ofwat's published wholesale base models.

Model	SES Water efficiency score	SES Water efficiency rank	Upper quartile efficiency score
WRP1	1.68	16	0.96
WRP2	1.77	16	0.96
WRP3	1.59	15	0.92
WRP4	1.67	16	0.90
WRP5	1.53	16	0.94
WRP6	1.61	16	0.96
TWD1	1.24	14	0.98
TWD2	1.31	15	1.00
TWD3	1.32	16	0.99
TWD4	0.96	2	1.01
TWD5	0.98	4	1.00
TWD6	0.97	4	0.98
WW1	1.49	17	1.00
WW2	1.50	17	1.01
WW3	1.53	17	1.02
WW4	1.53	17	1.02
WW5	1.41	17	0.93
WW6	1.42	17	0.93
WW7	1.17	13	0.97
WW8	1.19	14	0.95
WW9	1.14	13	0.96
WW10	1.15	13	0.96
WW11	1.12	12	1.00
WW12	1.15	15	0.98
Overall	**1.35**	**16**	**1.04**

Source: SES Water analysis

35. A key deficiency in the base cost models is the absence APH as a cost driver for pumping requirements. The models that include APH show a much-improved efficiency score than those that do not:

    (a) In the bottom-up treated water distribution (TWD) models, our efficiency score averages 0.97 in the models with APH as a cost driver, compared with an upper quartile efficiency score of 1.00. Where booster pumping stations per length of mains is used instead as the pumping cost drivers, our efficiency score averages 1.29 compared with an upper quartile score of 0.99.

    (b) In the bottom-up water resources plus models APH is not included as a cost driver at all, which results in our efficiency score averaging 1.64, compared with an upper quartile efficient score of 0.94.

    (c) In the top-down models, our efficiency score averages 1.15 in the models with TWD APH as a cost driver, and averages 1.48 in the models where booster pumping stations per length of mains is used instead.

36. It is clear from the above that the inclusion of APH has a material impact on our efficiency score. The exclusion of APH from the WRP models and the exclusion of water resources related APH from the top-down models distorts our efficiency score. As discussed above, we consider aggregate APH a far more appropriate cost driver for pumping requirements

than booster pumping stations per length of mains. The use of the latter as a cost driver has the incongruous effect of reducing SES' modelled expenditure despite our notably higher pumping requirements relative to the rest of the industry.

37. Fundamentally, given our benchmarking position going into AMP7, where we were broadly upper quartile efficient, we do not consider it credible for our efficiency position to have changed materially in such a short space of time.

38. Below, we show that once our modelled costs are adjusted for our cost adjustment claims, our expenditure in 2021-22 and 2022-23 were efficient on an upper quartile basis.

Rolling forward Ofwat's models to 2022-23

39. To estimate the upper-quartile efficient costs implied by Ofwat's published benchmarking models, we run the models with updated cost drivers but assuming no change to the efficiency score. For most of the cost drivers, we are able to populate the data using our 2022-23 APR submission. For the weighted average density variables, we extrapolate linearly based on the trend change between 2010-11 and 2020-21.

40. In the table below, we show our modelled costs against our outturn costs for the past five years and how this compares against the upper-quartile efficient costs based on a 1.04 upper-quartile efficiency score.

Table 2: Outturn wholesale modelled base expenditure against Ofwat's modelled cost estimates (£m, 2022-23 prices)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
SES' Outturn modelled costs (A)	46.3	42.7	54.9	51.7	48.6	51.2
Modelled costs from benchmark models (B)	36.6	36.8	37.2	37.3	37.7	37.2
UQ efficient costs from benchmark models (C)	38.0	38.2	38.6	38.7	39.1	38.7
Variance (D = A - C)	**8.3**	**4.5**	**16.3**	**13.0**	**9.5**	**12.5**

Source: SES Water analysis of Owat published base cost models

41. We see that over a six-year horizon, Ofwat's models imply that we have an efficiency gap of £10.7 million per annum on average. We do not consider that our efficiency position has fundamentally changed from PR19 where we were assessed to be upper quartile efficient. While we note that we have increased our capital expenditure, particularly since 2019-20, we consider this additional expenditure to have been both necessary and efficient. This increase in capital expenditure has been driven by three factors:

    (a) Additional investment to continue delivering a high-level of performance for our customers. Delivering upper-quartile performance sometimes requires additional investment, and we have challenged ourselves to maintain and improve our performance even if it necessitated spending more than was assumed in our AMP7 implied totex allowance. In particular, we note that:

    - We have maintained an upper-quartile performance on water quality and water supply interruptions,
    - We have one of the lowest levels of leakage in the industry,
    - We have outperformed our targets on unplanned outages and operational greenhouse gas emissions, and

- Our approach to network operation, maintenance and investment has allowed us to achieve one of the lowest numbers of mains repairs on average in the industry.

(b) Exposure to higher materials costs. As highlighted in Figure 6, inflation on construction materials has diverged significantly from CPIH inflation. Being a smaller water company on average, we have less bargaining power to delay or limit our exposure to such cost increases.

(c) We have brought forward a large proportion of our capital expenditure into the earlier years of this AMP, to make sure that we deliver the performance improvements required to meet our Performance Commitment targets. This may differ from the approach taken by others in the industry.

Real price increases in energy and chemicals costs

42. As discussed in Paragraph 27, we have rerun the Ofwat base cost models using the DESNZ industrial electricity price index as a cost driver. The inclusion of this cost driver meets Ofwat's conditions for its inclusion:

(a) There is a clear economic rationale for its inclusion given input prices directly affect costs, and changes in input prices are key drivers of company expenditure. Ofwat has also used input prices as cost drivers in its wholesale cost models previously.

(b) The DESNZ electricity price index is available for the full modelled period, is outside direct management control, and can be considered a reasonable reflection of water companies' exposure to movements in energy prices.

(c) The coefficient for the electricity price index has, as expected, a positive sign in all models. The driver is also statistically significant in the treated water distribution model and in most of the wholesale water models.

(d) The performance of the models remains robust with the inclusion of the electricity price index as a cost driver.

43. We include the model results in Annex A to this appendix. In the table below, we summarise the impact on our upper quartile modelled costs.

Table 3: Impact of including electricity price index as a cost driver, on SES Water efficient modelled costs (£m, 2022-23 prices)

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
UQ efficient costs from benchmark models (A)	38.0	38.2	38.6	38.7	39.1	38.7
UQ costs with electricity price index in models (B)	36.1	36.6	38.1	38.4	39.8	42.9
Impact on efficient modelled costs (C = B - A)	**-1.9**	**-1.5**	**-0.6**	**-0.3**	**0.7**	**4.2**

Source: SES Water analysis

Cost adjustment claim for pumping costs

44. We have submitted a cost adjustment claim for pumping costs – see Appendix SES027. The size of our claim will be dependent on the models selected by Ofwat and the implicit allowance for pumping provided within the existing models.

45. Assuming Ofwat's published base cost models are equally weighted, the net value of our claim over AMP7 is £35 million. In 2022-23 specifically, the value of our claim is £8.2 million, reflecting recent increases in energy costs.

Cost adjustment claim for higher regional wages

46. Alongside our submitted business plan, we have submitted a cost adjustment claim for our exposure to higher regional wage costs. We have reviewed the early cost adjustment claims submitted by Affinity Water and Southern Water and consider there to be merit to those claims. As detailed further in Appendix SES028, the net value of our clam over AMP7 is £6.9 million. In 2022-23 specifically, the value of our claim is £1.3 million.

Other symmetric adjustments

47. We note that other water companies have submitted cost adjustment claims which, if symmetric, would affect Ofwat's estimates of our efficient costs. For the purposes of our modelling, we have assumed the net effect of these claims is neutral as the impact of these claims on our implied allowance is uncertain.

48. We consider some of these claims have merit, and we consider some of these claims are likely to be symmetric or at least influence the implied allowance of other companies. While we do not provide a detailed commentary on each of these claims, we provide a summary of our thoughts in the table below.

Table 4: SES view on symmetrical cost adjustment claims

Company	Claim name	SES view on symmetry	SES view on merit of claim
Affinity Water	Regional wages	Likely to be symmetric	Supportive of claim. SES have taken a similar approach to estimating the impact.
Anglian Water	Boundary box replacements	Unlikely to be materially symmetric. As the claim is largely forward looking, the costs associated with boundary box replacements are unlikely to be implicit within historic costs.	No view
Anglian Water	Average Pumping Head	Likely to be symmetric	Supportive of claim. While SES have taken a different approach to estimating the impact, we note the size of the claims are broadly similar. We also note that the Anglian claim focuses on the TWD control, whereas the SES claim also covers WRP.
Bristol Water	Canal and River Trust	Unlikely to be materially symmetric. It is unlikely that costs associated with the Canal and River Trust are correlated with any of the cost drivers.	No view
Bristol Water	Leakage	Likely to be symmetric	Supportive in principle with the idea that higher leakage performance requires additional base expenditure.

Company	Claim name	SES view on symmetry	SES view on merit of claim
Hafren Dyfrdwy	Managing interruptions performance	Likely to be partly symmetric	Supportive in principle with the idea that higher performance requires additional base expenditure.
Hafren Dyfrdwy	Reservoir maintenance	Unlikely to be materially symmetric, as the claim is largely forward looking.	No view
Portsmouth Water	Lumpy maintenance expenditure	Likely to be symmetric. Lower capital maintenance expenditure in previous AMPs is likely to have artificially lowered both modelled costs and the upper quartile efficiency benchmark.	Supportive of the idea that base cost allowances should not introduce inconsistencies between AMPs.
Portsmouth Water	Replacement of head office building	Potentially symmetric depending on the extent to which Head office replacement costs have been captured within the historic cost data.	No view
Severn Trent Water	Network complexity	Likely to be partly symmetric	Retain the view in line with our pumping cost adjustment claim, that APH is the better driver of topography.
South East Water	Meter renewals	Unclear to what extent this would be symmetric	No view
South East Water	Network reinforcement	Unclear to what extent this would be symmetric	Ofwat would need to consider possibility of endogeneity in the approach taken by SEW.
South East Water	Economies of scale and water treatment works	Unclear to what extent this would be symmetric	Ofwat would need to consider possibility of endogeneity in the approach taken by SEW.
South Staffs Water	Regional topography	Likely to be symmetric	Supportive of claim. SES have submitted a similar claim given our own regional topography.
Southern Water	Meter replacement	Unclear to what extent this would be symmetric	No view
Southern Water	Regional labour costs	Likely to be symmetric	Supportive of claim. SES have submitted a similar claim
United Utilities	Reservoir dam maintenance	Unclear to what extent this would be symmetric	No view

Source: SES water

Comparing upper quartile modelled expenditure against our outturn modelled expenditure

49. In the table below, we show our modelled costs, once adjusted for our cost adjustment claims, against our outturn costs for the past five years and how this compares against the upper-quartile efficient costs based on a 1.04 upper-quartile efficiency score.

Table 5: Outturn wholesale modelled base expenditure against Ofwat's modelled estimates, including SES adjustments (£m, 2022-23 prices)

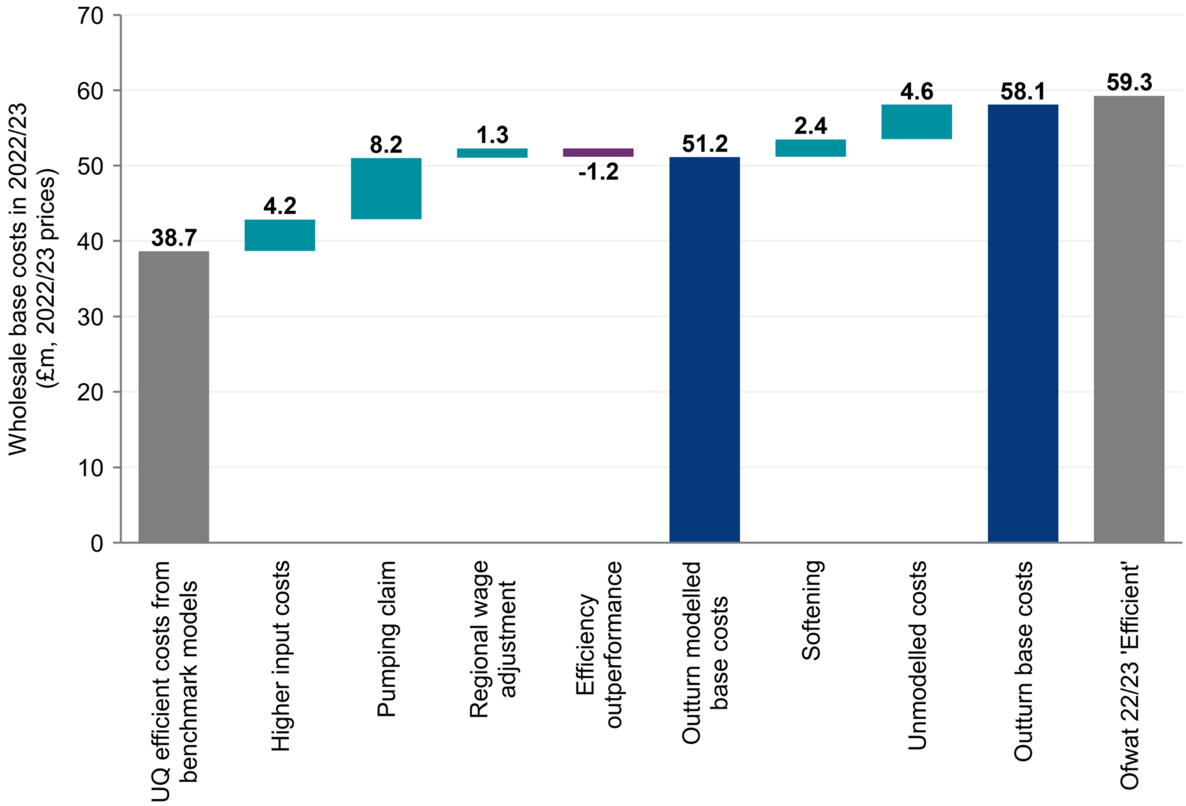
	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Outturn modelled costs (A)	**46.3**	**42.7**	**54.9**	**51.7**	**48.6**	**51.2**
UQ efficient costs from benchmark models (B)	38.0	38.2	38.6	38.7	39.1	38.7
Adjusting for higher power costs (C)	-1.9	-1.5	-0.6	-0.3	0.7	4.2
Pumping cost adjustment claim (D)	3.9	4.4	4.7	5.0	5.4	8.2
Regional wage cost adjustment claim (E)	1.8	1.5	-0.4	1.8	1.2	1.3
Adjusted estimate of efficient modelled costs (F)	**41.8**	**42.5**	**42.4**	**45.2**	**46.4**	**52.3**
Variance (G = A - F)	**4.5**	**0.1**	**12.5**	**6.4**	**2.2**	**-1.2**

Source: SES Water analysis of Ofwat published base cost models

50. We see that once our proposed cost adjustments have been included, and that once the impact of recent energy and chemicals cost increases are captured in Ofwat's modelling, our expenditure in 2022-23 was below what is implied by the upper-quartile efficiency benchmark. We illustrate this in the waterfall chart in Figure 8. Taking the first three years of AMP7 in total, our expenditure is above the upper quartile benchmark, by approximately £2.5 million per annum, though we consider this reflects our decision to frontload our capital programme within this AMP.

51. We recognise that the benchmark in 2022-23 will slightly flatter our efficiency position for that year, given our hedging position for energy costs. However, given we have been more immediately exposed to chemicals and construction cost increases, we consider our conclusion remains valid.

Figure 8: 2022/23 outturn expenditure on wholesale base compared with upper quartile efficient benchmarks.



Source: SES Water analysis

C. Benchmarking our future wholesale base costs

We have assessed the efficiency of our forecast wholesale base expenditure over AMP8 by comparing our forecast expenditure to updated efficient modelled costs from Ofwat's benchmarking models that account for forecast changes in cost drivers (e.g. customer numbers) and the impacts of real price effects, ongoing efficiency and unmodelled costs in the analysis.

We find our plan will continue to target upper quartile level efficiency for our wholesale water business in AMP8 once our cost adjustment claims, recent and future cost trends and scope for ongoing efficiencies (1% per annum) are accounted for. There are considerable modelling complexities in rolling forward the efficient modelled costs into AMP8 which Ofwat will need to carefully consider as part of its determination process.

52. In this section, we assess the efficiency of our AMP8 planned wholesale base expenditure. We review this planned expenditure against a simple roll-forward of Ofwat's benchmarking models with the adjustments described above. We also adjust to account for our estimates of unmodelled costs including those captured within our cost adjustment claim for softening costs. This means that our AMP8 comparison covers all wholesale base costs.

53. As with the previous section, we begin with the 24 base cost models published by Ofwat in its April 2023 consultation. We roll these forward using forecasts of each of the cost drivers. We also discuss our views on the appropriateness of rolling forward models based on historic costs only, as opposed to estimating models using historic and forecast costs over AMP6 to AMP8.

54. As before, we adjust the implied efficient expenditure from Ofwat's models to account for several factors that are not captured within the models. These are:

    (a) Real price increases that the industry has experienced in recent years that are not captured in Ofwat's benchmarking models, particularly, energy and chemicals costs.

    (b) Our cost adjustment claim for higher pumping costs due to our network topology. As discussed in Appendix SES027, the size of our claim is dependent on the models chosen by Ofwat – if Ofwat were to select models that include APH as a variable, the size of our claim would reduce accordingly.

    (c) A new company specific cost adjustment claim we have submitted for higher regional wages, drawing on the claims submitted by Affinity Water and Southern Water.

    (d) Our company specific cost adjustment claim for softening costs. This relates to our longstanding duty to soften water on behalf of our customers.

    (e) Future real price effects, covering labour, energy, chemicals, and materials.

    (f) Our estimate for on-going efficiency.

    (g) Our other non-modelled costs covering lane rental, local authority rates, and costs associated with the Traffic Management Act.

55. We then compare this adjusted upper quartile efficient estimate against our AMP8 planned expenditure. Details of how we have put together our AMP8 plan, are presented in the Chapter 7 – Explaining our costs, in the main business plan.

Projecting the allowance within Ofwat's benchmarking models

56. We have estimated the implied allowance for AMP8 (before accounting for the cost adjustment claims) from the Ofwat published base cost models. We do this by projecting each of the cost drivers that are used in Ofwat's models, then inputting them into the models before triangulating between them, assuming an equal weighting.

57. We do this for two sets of models:

    (a) The original models as published by Ofwat in its Spring 2023 base cost modelling consultation.

    (b) A variant of the models that include an electricity price index as an additional cost driver in each of the models.

58. We have projected each of the cost drivers as follows:

    (a) For the number of properties, we extrapolate based on the compound annual growth rate (CAGR) between 2011-12 and 2022-23, at 0.67% growth per annum.

    (b) For the length of mains, we similarly extrapolate based on the CAGR between 2011-12 and 2022-23, at 0.22% growth per annum.

    (c) For the proportion of water treated at complexity levels 3 to 6, we keep this constant at 100%.

    (d) For the weighted average treatment complexity, we extrapolate based on the CAGR between 2011-12 and 2022-23, at 0.2% reduction per annum.

    (e) For the number of booster pumping stations, we keep this constant at 33.

    (f) For average pumping head, we also keep this constant based on the 2022-23 value of 88.9m per head.

    (g) For the weighted average density variables, we again extrapolate based on the CAGR between 2011-12 and 2022-23.

59. Annex B to this appendix presents the forecasts for each of the cost drivers, over the years 2025-26 to 2029-30, that we have used in this analysis. The resultant forecast of modelled and efficient modelled costs – i.e. after the application of the upper quartile efficiency challenge – is as follows.

Table 6: Estimates of modelled expenditure using Ofwat's published base cost models and forecast cost drivers (£m, 2022-23 prices)

	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8
Modelled costs	38.1	38.4	38.7	38.9	39.2	**193.3**
UQ costs	39.5	39.8	40.1	40.4	40.8	**200.7**

Source: SES Water analysis

Real price increases in energy and chemicals costs

60. In the variant of the models where we include an electricity price index, we use a hybrid index that combines the DESNZ electricity price index up to 2022-23 and then a Cornwall Insight forecast from 2023-24 onwards. As the DESNZ electricity price series is presented in index form and represents a hedged forecast, while the Cornwall Insight projections are presented as absolutes price and represent a spot forecast, we have made a number of assumptions to combine them into a single hybrid series. These assumptions are detailed in Annex B alongside the projection of the price index.

61. The resultant cost driver forecast is provided in Annex B and estimated efficient costs are presented in the table below.

Table 7: Impact of including electricity price index as a cost driver, on efficient modelled costs (£m, 2022-23 prices)

	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8
UQ efficient costs from benchmark models (A)	39.5	39.8	40.1	40.4	40.8	**200.7**
UQ costs with electricity price index in models (B)	44.5	44.4	43.7	43.6	45.7	**221.9**
Impact on efficient modelled costs (C = B - A)	**5.0**	**4.6**	**3.6**	**3.2**	**4.9**	**21.2**

Source: SES Water analysis

62. We note that in our benchmarking we have accounted for this step in our analysis as part of the core base modelling framework as opposed to a separate cost adjustment claim. This is because, as outlined above, the impacts of the real increases in energy and chemical costs can be addressed explicitly within Ofwat's modelling and the issue is in our view an industry wide challenge as opposed to a company specific issue. How this step in Ofwat's efficient cost modelling is addressed also has interactions with how an allowance for energy and chemical real price effects might be accounted for.

63. If Ofwat were to account for this step in our modelling as an industry wide cost adjustment claim, then it would clearly meet the criteria Ofwat has set for these claims, as we summarise in the box below.

Box 1: Assessment of the real price increase adjustment in our benchmarking modelling against Ofwat's cost adjustment claim criteria.

Need for an adjustment.

As detailed in Section B there is a clear need for this adjustment in Ofwat's modelling given the significant inflationary pressures that have affected the industry in the current AMP, and the need to reflect the appropriate price level of input costs in Ofwat's efficient modelled costs rolling forward into the next AMP. Ofwat's unadjusted base cost models cannot be assumed to capture the appropriate price level of inputs for the purposes of setting a base year for any real price effect adjustment that might be applied looking forward to AMP8. How to account for the impact of recent inflationary pressures is, however, complicated given that individual companies may have different contracting positions and operational strategies to manage these costs, e.g., energy hedges, or mix of power purchase agreements and own generation.

Cost efficiency.

An adjustment is necessary to ensure that companies including ourselves can recover the overall efficient costs of running our wholesale business. We consider the approach we have taken in our benchmarking – informed by the advice from KPMG – to capture the impact of increases in energy and chemical prices has two key benefits. First, it uses empirical estimates of the historical relationship (elasticity) between industry base costs and a benchmark index of delivered prices for industrial/non-SME energy users. This limits the number of assumptions that need to be made in rolling forward benchmarked efficient costs and controls for the impact of hedging and own-site generation via the modelled relationship of the water company base costs to changes in the delivered energy price index. Second, the approach we have taken to estimating the impact of energy prices on our efficient modelled cost base also partially accounts for increases in chemical prices, given the correlation between energy and chemicals prices and to a degree other input prices (e.g., construction materials) with a high energy component in their production.

Seeking to capture the impacts of recent input price trends on company costs – with the expected variation of impacts across individual companies – is complex and specific, off model, adjustments may not be sufficiently transparent and consistent with an independent cost benchmark for the purposes of Ofwat setting its PR24 price controls. We consider the approach that we have taken in this appendix – guided by the report we and others commissioned from KPMG – provides a pragmatic and transparent approach to the problem. It is also consistent with the principle of promoting cost efficiency as it will implicitly account for the impacts of energy hedging and other mechanisms that water companies can use to manage input price inflation risk, particularly in relation to energy, and sets an independent benchmark for companies' own costs.

Other adjustment claim criteria.

We do not consider the other adjustment claim criteria would be relevant to this adjustment to Ofwat's models. This adjustment reflects the need to sufficiently capture an industry wide cost trend as opposed to a requirement for additional funding to reflect, for example, additional company specific maintenance requirements or a specific company requirement, such as our statutory obligation to soften.

Efficiency benchmarking using both historical and forecast costs

64. We note that in PR19, Ofwat set wholesale base cost allowances by benchmarking historic costs and projecting them using forecast cost drivers. We also note that in the PR24 Final Methodology, Ofwat is considering undertaking the base cost benchmarking against both historic and forecast costs.

65. We would be supportive of Ofwat exploring this approach, for the following reasons:

    (a) We understand that there is likely to be a step-change in ambition across the industry in terms of delivery, and particularly, delivery from base. A simple roll-forward of historic models is unlikely to capture that ambition, and risks providing insufficient funding to deliver on that ambition.

    (b) There has been a step change in costs across the industry in a number of areas, including energy, chemicals and construction materials. While RPE indexation, pre-/post- modelling adjustments, and the inclusion of cost drivers in the benchmark models are all potential solutions, forward-looking benchmarking may also be a potential solution where independent cost forecasts do not exist.

66. Given the industry data is not available at this time, we have not been able to explore the advantages and disadvantages of this approach in this submission and the implications for the efficiency of our business plan expenditure. Should Ofwat decide to undertake base cost benchmarking against both historic and forecast costs, we would encourage it to consult with companies to ensure that the issues with taking such an approach are understood and appropriately addressed in the conclusions Ofwat reaches in its draft and final determinations.

Cost adjustment claim for pumping costs

67. As noted above, we have submitted a cost adjustment claim for pumping costs. In our early cost adjustment claim, we estimated that SES Water will need an allowance of £31 million (£6.2 million per annum), in 2022/23 prices, based on the detailed methodology we developed to calculate our claim. This was in addition to what is implied within Ofwat's proposed base cost models, reflecting mitigating actions our management have taken to reduce our exposure.

68. For our final Business Plan submission, we have reviewed our claim further. We have made a number of changes that have influenced the size of our claim.

   (a) We have re-estimated the proportion of our claim that is implicitly captured within our softening claim. We have estimated this on a bottom-up basis, replacing the broad but conservative assumption applied previously.

   (b) We have updated our estimates of the energy price increase to 2022/23 in line with the most recent statistics from DESNZ.

   (c) We have made a number of smaller updates to align our assumptions with those used elsewhere in our business plan submission.

69. Based on these adjustments, we have revised the size of our claim to £42 million over AMP8, or £8.4 million per annum, before adjusting for real price effects and ongoing efficiency beyond 2022-23. We consider this revised figure continues to be appropriate – the revised value of the claim is in a similar ballpark range to the symmetric adjustments proposed by other water companies who have submitted a similar claim.

70. After accounting for real price effects and on-going efficiency, our claim increases to £46.1 million (2022/23 prices). This is because a large proportion of our pumping claim relates to energy costs.

Table 8: Summary of Pumping Cost Adjustment Claim for AMP8 (£m, 2022-23 prices)

	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8
Pre-RPE and ongoing efficiency						
Water Resources Plus	4.4	4.4	4.5	4.5	4.5	**22.3**
Treated Water Distribution	3.9	3.9	3.9	4.0	4.0	**19.7**
Total	**8.3**	**8.4**	**8.4**	**8.5**	**8.5**	**42.0**
Post-RPE and ongoing efficiency						
Water Resources Plus	4.9	4.9	4.9	4.9	4.9	**24.5**
Treated Water Distribution	4.3	4.3	4.3	4.3	4.3	**21.7**
Total	**9.2**	**9.2**	**9.2**	**9.2**	**9.3**	**46.1**

Source: SES Water

Cost adjustment claim for softening costs

71. As discussed above, we have also submitted an early cost adjustment claim resulting from our unique statutory obligation to soften the water we provide to over 80% of our customers. The value of the claim is £31.6m over AMP8.

72. We have a unique statutory obligation to soften the supply of water to our customers. Most of our local groundwater sources require the treatment of water to achieve target levels as a consequence of natural hardness. Within this unavoidable requirement, we have optimised our softening treatment and associated costs.

73. The costs associated with our softening operations have been excluded from Ofwat's base cost modelling. This is because there are no comparable obligations, activities, or costs against which to benchmark other companies in England and Wales. We have therefore assessed our full costs as being in scope for a potential adjustment, as set out in detail in Appendix SES029.

74. We have undertaken a detailed bottom-up assessment of the additional expenditure (opex and capex) that we will incur in AMP8 arising from our unique statutory softening obligations. Consistent with the approach that we adopted in our PR19 claim for softening costs, our estimate of the additional opex we will incur is primarily based on the most recent year's data of our incurred costs. In preparing our submission, we also take into account the impact of the evolution of customer demand and the expected reduction in leakage in AMP8 on our softening related opex.

75. Our estimate of the additional capex we will incur in AMP8 is based on capital maintenance modelling and asset replacement cycles across the sites. We are confident our costs are efficient. We routinely benchmark our unit costs internally and externally, proactively manage variation in specific cost categories and benchmark our input cost assumptions to well-regarded market benchmarks (e.g., cost of power).

76. Based on these adjustments, the size of our claim is £29.1 million over AMP8 before RPE and on-going efficiency adjustments, and £30.7 million over AMP8 post-RPE and on-going efficiency, as shown in the table below. The majority of the difference between the pre-RPE and post-RPE figures relate to energy costs, which are expected to increase materially in 2025-26 as our current electricity price hedges expire.

Table 9: Summary of Softening Cost Adjustment Claim for AMP8

	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8
Pre-RPE and ongoing efficiency						
Opex – Water Treatment	3.1	3.0	3.0	3.0	3.0	**15.1**
Capex – Water Treatment	6.2	6.2	0.3	0.3	0.9	**14.0**
Total – Water Treatment	**9.3**	**9.3**	**3.4**	**3.3**	**3.8**	**29.1**
Post-RPE and ongoing efficiency						
Opex – Water Treatment	3.6	3.5	3.3	3.2	3.3	**17.0**
Capex – Water Treatment	6.2	6.1	0.3	0.3	0.8	**13.7**
Total – Water Treatment	**9.8**	**9.6**	**3.6**	**3.5**	**4.1**	**30.7**

Source: SES Water

Cost adjustment claim for higher regional wages

77. Consistent with our benchmarking of our historical (2022/23 outturn) costs, we have also included an adjustment for higher regional wages in the modelling.

78. Our labour costs are structurally higher than those in the industry as a whole owing to our geographic location. Having reviewed the early CACs submitted by other companies – namely Affinity Water and Southern Water – we have included a supplementary cost adjustment claim in our final business plan submission.

79. This increases our efficient modelled costs by £1.1 million per annum. or £5.7 million in total over AMP8, which is the size of our total cost adjustment claim. We provide a breakdown by price control in the table below. The justification for this claim is set out above and in Appendix SES028 which provides our full cost adjustment claim consistent with Ofwat's assessment criteria.

Table 10: Summary of Regional Wage Cost Adjustment Claim for AMP8

	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8
Water Resources Plus	0.0	0.0	0.0	0.0	0.0	**0.0**
Treated Water Distribution	1.2	1.2	1.1	1.1	1.1	**5.7**
Total	**1.2**	**1.2**	**1.1**	**1.1**	**1.1**	**5.7**

Source: SES Water

Views on other symmetric cost adjustment claims

80. We have set out above our views on the symmetric cost adjustment claims that other companies submitted to Ofwat. Overall, we consider that some of these are more justified than others and in a number of cases the claims that we consider are the strongest – e.g. the treatment of APH in the modelling – overlap with our own claim. We have as a result, assumed in our benchmarking that the impacts of other companies' symmetrical claims are neutral in their impact on our efficient modelled costs.

Real price effects

Treatment in the efficient cost modelling for AMP8

81. Like any other water company, we expect the prices of some of our inputs to increase by more or less than the rate of inflation. The input price assumptions we have used in our *business plan expenditure forecasts,* do not fully align with the assumptions we use when *benchmarking the efficiency of our business plan*.

82. The assumptions we use for our *efficiency modelling / efficiency benchmarking*, reflect our view of industry-wide input price pressures and are based on external forecasts. While we expect this to match the input price pressures we will face over AMP8, the estimates we have used to set our *business plan expenditure forecasts*, reflect company specific factors, such as our hedging position and our willingness to challenge ourselves to manage such pressures.

83. For the purposes of our efficiency modelling, we have reflected the following real price effects adjustments in the benchmarking:

- **Electricity / energy:** We roll forward the impact of changes to our electricity price index on efficient modelled costs in AMP8 using the approach outlined above (see paragraph 59-62 and Table 9 above). In summary, we use forecasts of the retail electricity price from Cornwall Insights to construct an electricity price index, which we then include as an additional cost driver in the base cost models. Under this approach, we do not need to assume a weighting for the proportion of base costs that relate to energy. It also means that our approach for capturing energy RPEs up to 2022-23 is consistent with our approach for capturing energy RPEs beyond 2022-23.
- **Chemicals:** The approach we have taken to model the impact of changes in energy prices in AMP8, also implicitly reflects some change in chemical and materials prices in our modelling to the degree these input prices are correlated with the energy price index used. We do not assume any further changes in chemicals prices beyond those proxied by the electricity price index.
- **Materials:** Given mixed evidence of the short and longer-term wedge between CPIH and materials, plant and equipment prices, we have assumed this component of the modelled cost base will track the movements in the CPIH. As

above, any changes in materials prices that are correlated with energy prices, will be reflected implicitly within the approach we take to model an energy RPE.

- **Labour:** We assume costs will rise consistently with the latest OBR economic forecast for average hourly wages, consistent with the source of wage rate forecasts used by Ofwat (and the CMA) at PR19. We assume a labour cost weighting of 43% based on the weightings used in PR19.

84. Our assessment of the input price pressures as reflected in our business plan cost forecasts, are the outcome of our inter-departmental budgeting process. We have filled out our RPE estimates within the relevant data tables, consistent with the following.

- **Electricity:** Given our hedged position, we expected our power costs on a per unit basis will stay relatively flat over AMP7 before increasing substantially. As we are yet to determine our hedging strategy for AMP8, we have based our forecasts of electricity costs based on forecast consumption and a forecast unit retail price from Cornwall Insights – see Appendix SES005C.
- **Chemicals:** Chemical costs for AMP8 have been forecast on the basis that the price of chemicals used in the 2022/23 period remain constant in real terms.
- **Labour:** While we expect our labour costs – wage rates – will increase with the OBR hourly wage forecast, rather than simply CPIH inflation, we are seeking to manage the increase in expenditure such that our overall opex remains in line with CPIH inflation.
- **Other:** We have assumed that the remainder of our business plan expenditure will increase with CPIH inflation.

85. As described in Annex B, we have assumed some correction of the rise in energy prices consistent with the forecast by Cornwall Insight we have used to develop our own base cost forecast. As discussed in Chapter 7 of our plan, given the uncertainty around future energy prices, we are yet to determine the most appropriate strategy for the procurement of our power once our existing hedge expires at the end of the current AMP. This means that it is not certain that the trajectory of our energy costs will precisely follow the Cornwall Insight forecast. Nevertheless, we consider adopting Cornwall's forecast the most, indeed only, logical assumption at this point in time for forecasting our business plan expenditure and assessing the efficiency of our plan.

86. It is also important to note that our forecast of energy RPEs from 2022-23 within our benchmarking exercise, is predicated on Ofwat adjusting the base cost modelling outputs for increases in energy costs up to 2022-23.[5] It would not be appropriate or consistent for Ofwat to apply our modelled energy price RPE adjustment (from 2023/24 onwards and which reflect an expected downward trend in prices as currently reflected in Cornwall Insight's price projections) without also capturing this required step change in input prices to Ofwat's base cost model allowances to set an appropriate 2022/23 "base year" cost.

Uncertainty mechanisms for input price pressures

87. The future outlook for power and energy prices, and input prices in general, is very uncertain. As such we consider that Ofwat should introduce a form of ex-post adjustment 'uncertainty mechanism' that will align price control allowances with outturn rather than forecast energy price trends. This will provide protection to both consumers and companies during what is likely to be a very volatile period and will help to mitigate the risk of unintended consequences. Alongside this, we will of course continue to maintain an effective operational strategy for the procurement of our power.

[5] See paragraphs 20-27, 40-41 and 59-62 above

88. It is inevitable that actual prices different companies are exposed to will differ from company to company, given the differences in our respective hedging strategies. We therefore think a simple approach for capturing energy price effects in totex allowances, that is linked to observed market prices and a simple, well-structured, uncertainty mechanism, is a justified approach for Ofwat to take at PR24 because:

- it is a simple and transparent approach, based on published market benchmark prices, that avoids the risk that allowances are set based on arbitrary assumptions (e.g., of an 'appropriate' hedging strategy for companies);
- linking our price controls to forecast/observed energy market prices will mean that the risks and impacts of contracting (hedging and derivatives) and own generation investment decisions, will lie with companies to manage;
- this creates the right incentives for companies to minimise our energy purchase costs and is consistent with Ofwat's objective of setting an independent notional company efficient cost allowance to set the price controls;
- no modelled approach will ever be able to accurately capture differences of individual companies expected prices and hedging strategies leading into AMP8 (including own generation and exports, if any); and
- there remains considerable uncertainty of the future outlook for energy prices in the next AMP and how prices will move relative to CPIH. This justifies the use of an uncertainty mechanism, rather than solely an ex-ante forecast of expected energy prices, to set the PR24 price controls.

89. There is also considerable uncertainty of future trends in our other input prices in the next AMP, in particular, in chemicals costs. As a result, we would support Ofwat also applying a form of ex-post adjustment/true-up mechanism to our labour and chemical (and potentially materials) input prices in setting totex allowances for PR24, consistent with the principle that Ofwat look to labour input price inflation at PR19.

Ongoing efficiency

90. As well as trends in prices, the other key determinant of future productivity and efficient costs is ongoing efficiency or frontier shift. This refers to the efficiency improvements companies are typically able to make over time. Ofwat state in the Final Methodology: "*Over time we expect the productivity of companies to improve as they adopt new technologies or new ways of working. These productivity improvements shift the efficiency frontier for the sector, and therefore apply to all companies. These improvements are in addition to the catch-up efficiency challenge.*"[6]

91. Evidence on ongoing efficiency is mixed. There are various accepted sources of data for assessing productivity over time. However, results tend to be volatile from year to year, and are different depending on whether they are based on data for gross output or value added, and based on the comparator sectors chosen.[7] UK regulators – generally supported by recent appeal processes to the CMA – have tended to set ongoing efficient challenges of c. 1% per annum, typically supported by evidence from the EU 'KLEMS' database. The CMA adopted a 1% Frontier Shift challenge in its Final Determination for the PR19 appeals (0.1% less than Ofwat's decision) in 2020 on the basis:[8]

- Companies in competitive sectors with similar activities to the water companies achieved between 0.3% and 1.2% average annual Total Factor Productivity (TFP)

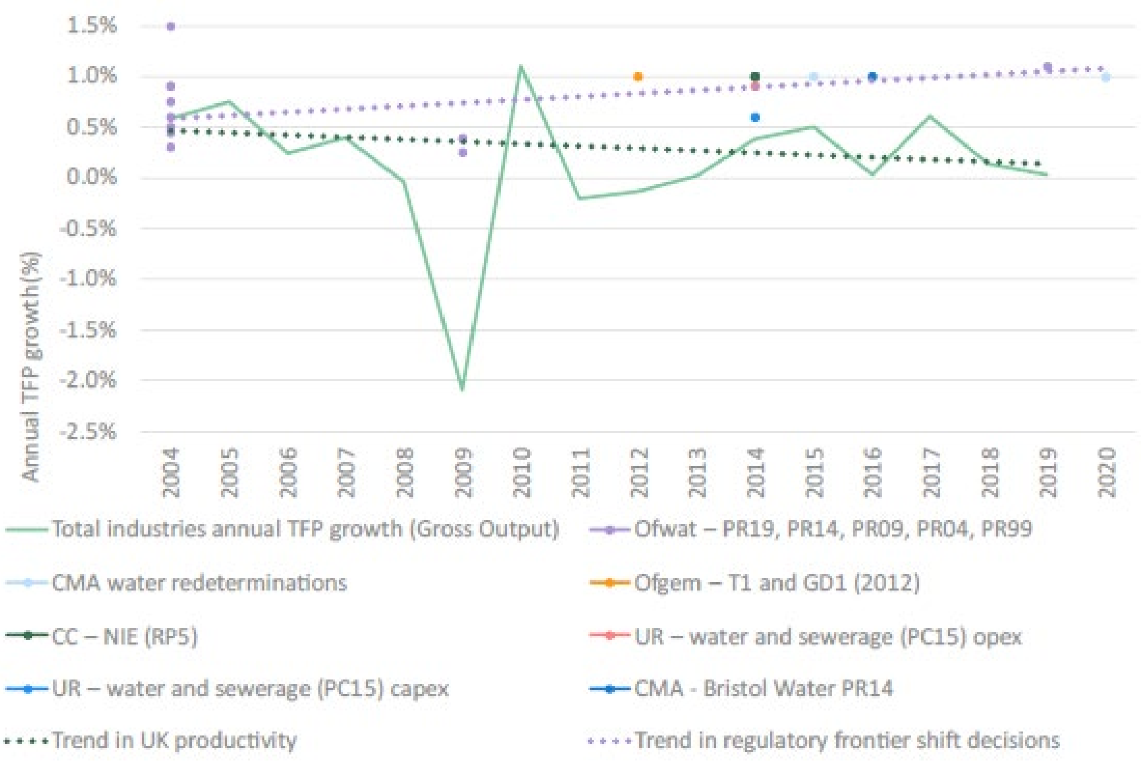
[6] Ofwat (2022): 'PR24 – Final Methodology - Appendix 9 – Setting expenditure allowances', p.38
[7] See Economic Insight (2023): 'Productivity and Frontier Shift at PR24'
[8] CMA (2021): 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations', Paragraphs 4.616 to 4.619, pp.263-264

growth per year. The CMA referenced that the average rate of TFP growth across relevant sectors was 0.7% per year, based on the gross output measure.

- There were reasons, in the CMA's opinion, which suggested the water companies would be able to achieve productivity gains greater than the 0.7% average comparator estimate, including the impacts of embodied technical change, and that some weight should be placed on 'value added' measures of TFP.
- It was plausible that water companies might be able to achieve some additional productivity growth due to the increased flexibility in the totex and outcomes framework and that the majority of the disputing companies in the PR19 appeal had proposed a similar objective to the 1% ongoing efficiency challenge the CMA adopted in its determination.
- The CMA also referenced that estimates of TFP using databases such as the ONS and EU KLEMS may also not fully account for the impacts of scope of embodied technical change.

92. The CMA also noted that the more recent TFP comparator data (2008 to 2014) appeared lower than its 0.7% comparator estimate, and that more broadly wider UK productivity growth had slowed. The UK has experienced 15 years of comparatively low (relative to before the 2008 global financial crisis) TFP across the wider economy as is illustrated in the figure below which is drawn from a recently published study by Economic Insight commissioned by other water companies on the scope for frontier shift in the water sector during PR24.

Figure 9: UK TFP (Gross Output) vs. Frontier Shift regulatory decisions



Source: Economic Insight[9]

[9] Economic Insight (2023): 'Productivity and frontier shift at PR24'. This report was commissioned by a club of companies including Affinity Water, Anglian Water, Bristol Water, Northumbrian Water, Severn Trent Water, South East Water, South

93. As we set out in Chapter 7 – Explaining our costs, of the main business plan, we have adopted a 1.0% per annum ongoing efficiency target for our PR24 Business Plan and reflect the same target level in the analysis we have undertaken to assess the expected efficiency of our base costs in AMP8. However, in contrast to our own business plan base costs (where our ongoing efficiency target is applied from the start of AMP8 when the efficiencies can be realised from our bottom-up budgeted costs for the final year of AMP7), we have applied the ongoing efficiency challenge in the efficient modelled costs from 2022/23 onwards, consistent with our assumption of how Ofwat will apply this adjustment in its own cost modelling.

94. We consider 1% to be a stretching and ambitious ongoing efficiency challenge because:

- It is aligned with the CMA's decision to apply a frontier shift/ongoing efficiency target of 1% per annum in its 2021 PR19 determination, where the CMA concluded "*there were reasons which suggested the water companies would be able to achieve productivity gains greater than the 0.7% average comparator estimate.*"[10]
- It is above the 'plausible range' of 0.3-0.8% that Economic Insight have more recently (April 2023) estimated for other water companies on the scope for frontier shift/ongoing efficiency at PR24.[11]
- We are challenging ourselves to make meaningful improvements in performance from our base expenditure and we consider there is some risk of double counting the scope for frontier shift in both efficiency challenges.[12]
- There is increasingly evidence of a slowdown in productivity in the broader UK economy and while there are factors that mean our scope for ongoing efficiency in AMP8 may be higher than the headline rates of productivity improvement in the economy, we do not consider we are fully immune to these tailwinds.
- The scope for frontier shift/ongoing efficiency in the next AMP is ultimately a business judgement based on an imperfect data set and evidence base. We consider a 1.0% p.a. efficiency target to be stretching given:
  (i) the tailwinds and uncertainties that the sector faces looking forward into the next AMP (including from input price pressures); and
  (ii) the improvements that we want to deliver for our customers, that ultimately require investment in our network.

95. Ofwat references that it expects to consider the impact of innovation funding on water companies' scope to achieve ongoing efficiency in AMP8.

96. We note that the level of innovation funding that has been provided in the sector – and that SES Water has specifically received – is relatively small relative to overall expenditure requirements. The CMA RIIO-2 appeal process, while supportive in principle that there may be a link between scope for productivity and innovation funding, also concluded that the evidence was not sufficiently conclusive for an explicit adjustment to be made in setting an ongoing efficiency target. Economic Insight also conclude that: "*the total size of the innovation fund (£200m) relative to total industry totex set by Ofwat in its PR19 FD (£49.6bn) is approximately 0.4%. As such, it is doubtful that the fund can materially affect productivity.*" They also note that "*the proportion of innovation funding*

Staffordshire Water, South West Water, Southern Water, Thames Water, United Utilities, Welsh Water, Wessex Water and Yorkshire Water.
[10] CMA (2021): 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations', para 4.616
[11] Economic Insight (2023): 'Productivity and frontier shift at PR24'. On its plausible range, Economic Insight comment that "we think it is implausible, but not impossible, for frontier shift to lie outside this range". Our 1% per annum target is further above the top end of Economic Insight's PR24 focused range (0.3-0.7%).
[12] See discussion of this issue in Economic Insight (2023): 'Productivity and Frontier Shift at PR24', p.10

provided to water economies [Sic] *that is intended for efficiency gains, relative to positive externalities, is unclear.*"[13]

97. Overall, we consider any impact of innovation funding on the scope for ongoing efficiency to already be captured within our overall target of 1.0% p.a. We would also note that within our wholesale business in particular, new opportunities from use of artificial intelligence, data and new technologies are focused on driving productivity in terms of performance improvements (e.g., leakage and supply interruptions via the use of our smart network) rather than necessarily cost reductions. It is for this reason, that Ofwat needs to carefully consider the productivity 'stretch' that is set across both the ongoing efficiency adjustment it makes to base costs and the performance commitment levels it is expecting companies to achieve from base.

Non-modelled costs

98. Unmodelled base costs consist of a small number of cost items that are more suitable for separate assessment - either because they are driven by specific regional requirements and/or are largely outside of company control.

99. During the current AMP, we have faced upward pressures on a number of these expenditure items, notably changes to abstraction costs levied by the EA and traffic management requirements in our local area. The upward pressure on these costs has been captured in our departmental budgeting process for final two years of AMP7 and we have assumed these pressures will remain part of our cost base in the next AMP. Table 11 below provides our commentary on the key unmodelled cost items and how we have approached developing a forecast for AMP8.

Table 11: Summary of non-modelled cost forecasts, 2022/23 prices

	AMP8 £m	Comments
Local authority and Cumulo rates	14.9	We expect local authority rates to reduce in 2024/25 due to a reduction in the rateable value of our asset base. We assume these rates will then stay flat in real terms through to the end of AMP8.
EA abstraction charges	5.1	We assume EA abstraction charges stay constant, such that any increases in abstraction charge rates are offset by lower levels of abstraction.
TMA & lane rental charges	3.0	We forecast an increase in expenditure associated with the Traffic Management Act commensurate to the step-increase in capital expenditure.

Source: SES Water analysis

100. We include an estimate of unmodelled costs in our efficient modelled costs for the purposes of benchmarking our AMP8 base cost expenditure plans.

Comparing against our AMP8 plan

101. In the table below, we show our efficient modelled costs, once adjusted for growth in network cost drivers, cost adjustment claims, real price effects, ongoing efficiency and

[13] Ibid., p. 25.

unmodelled costs. The total modelled base cost includes our cost adjustment claim related to our statutory obligation to soften.

Table 12: Forecast wholesale modelled base expenditure against Ofwat's modelled estimates, including SES adjustments (£m, 2022-23 prices)

	2025/26	2026/27	2027/28	2028/29	2029/30	AMP8
Business plan costs (A)	**68.0**	**70.3**	**66.3**	**59.4**	**59.0**	**323.0**
UQ efficient costs from benchmark models (B)	39.5	39.8	40.1	40.4	40.8	**200.7**
Electricity price adjustment to 2022/23 (C)	4.3	4.3	4.4	4.4	4.4	**21.9**
Regional wage CAC (D)	1.2	1.2	1.1	1.1	1.1	**5.7**
RPEs beyond 2022-23 (E)	1.5	1.3	0.4	0.1	2.1	**5.4**
Ongoing efficiency (F)	-1.4	-1.8	-2.3	-2.7	-3.3	**-11.5**
Pumping CAC, post-RPE and post-OE (G)	9.5	9.5	9.5	9.5	9.6	**47.6**
Softening CAC, post-RPE and post-OE (H)	9.9	9.7	3.7	3.6	4.2	**31.0**
Unmodelled costs (I)	4.6	4.6	4.6	4.6	4.6	**23.0**
Adjusted estimate of efficient costs (J = B + C + … + I)	**69.2**	**68.6**	**61.7**	**61.1**	**63.4**	**324.0**
Variance (K = A - J)	**-1.2**	**1.6**	**4.6**	**-1.7**	**-4.4**	**-0.9**

Source: SES Water analysis of Owat published base cost models

102. As we conclude in Chapter 7 of the main plan, taking the analysis in the round, we find that our plan is approximately £0.2m per annum lower than a simple extrapolation of Ofwat's models and our CACs. We consider this may underplay the ambitiousness of our plan on the basis: (i) we face company specific and industry wide pressures impacting our base costs (in particular, our capital programme) that may not be adequately accounted for in a simple roll forward of Ofwat's models, even with our energy-related adjustment; (ii) we have committed to achieving a stretching ongoing efficiency target of 1% p.a. in AMP8; and (iii) we have committed to achieving stretching levels of performance through base.

103. While we do not have the industry wide business plan data available to confirm this, we expect the aggregate increase in our forecast base spend will not be out of line with other companies in the sector. Overall, taking into consideration the analysis we have undertaken, the uncertainty and range of debatable decisions that need to be made at the different stages of Ofwat's cost efficiency modelling and Ofwat having yet to identify its preferred base cost models for PR24, we have concluded our business plan, in the round, is consistent with Ofwat's stretching benchmarks once the key adjustments we have set out above to Ofwat's models are accounted for.

104. We look forward to further engagement with Ofwat on these issues ahead of its determination process.

D. Benchmarking our retail base costs

As with our wholesale base cost forecasts, we have benchmarked our outturn and forecast retail costs against the allowances we may receive through Ofwat's efficient cost modelling.

Overall, we conclude that the efficiency of our retail business has been improving in the current AMP and we project our retail costs to be consistent with an upper quartile efficiency benchmark by AMP8 once our cost adjustment claims to Ofwat's retail cost models are taken into consideration.

105. In this section we set out the analysis we have undertaken to benchmarking out retail base costs. First, we set out our views of Ofwat's retail benchmarking models, before presenting the results of our analysis.

Our view of Ofwat's benchmarking models

106. Consistent with Ofwat's guidance we have taken into consideration the 11 different models it has developed for modelling efficient retail costs for PR24. This includes 3 bad debt cost models and 2 other cost models that together form a 'disaggregated' approach to retail cost benchmarking, and 6 total cost models. As we note in Chapter 7, it is challenging to model efficient costs accurately and Ofwat publishing a broad range of models has helped highlight which work well and which work less well.

107. As we have previously set out in our response to Ofwat's PR24 econometric base cost model consultation,[14] we do not agree with the full set of residential retail cost models that Ofwat has proposed for PR24. The quality of models (based on Ofwat's own tests) is variable. In some cases, the quality and robustness of the models is too low to warrant their inclusion in the evidence base. The model results – in terms of their implications for efficiency – are also mixed. Other, equally robust models have been set aside that would generate materially different efficiency scores and rankings. Much of what we set out below repeats the comments we raised with Ofwat's retail cost models as part of that early consultation response.

108. In our view, it is possible to generate a set of usable conclusions based on a subset of the available models. However, in reaching this position Ofwat must:

- ensure that it follows its own process in selecting and weighting different models - and to be clear, we recommend rejecting some of the consultation models entirely; and
- consider carefully the strength of the efficiency challenge that can be justified on the basis of its selected models.

109. A robust evaluation based on Ofwat's own criteria indicates that only three of the top-down models - RTC1-3 - are suitable as a basis for setting allowances. The disaggregated/bottom-up models, in combination, fail to produce robust and reasonable results and should be restricted to use as cross-checks (bad debt cost models) or discarded (other cost models).

110. In reaching this assessment, we have used Ofwat's own proposed model assessment criteria. We have evaluated which models explain a high proportion of variation in costs.

[14] SES Water (12 May 2023): 'Response to the consultation on PR24 econometric base cost models'

We have considered the direction, magnitude and significance of the chosen explanatory variables, as discussed in the subsections below.

Ofwat's disaggregated/bottom-up retail cost models

111. The two proposed bottom-up models for other retail costs perform very poorly, and do not in our view add anything to the evidence base. Neither model is able to explain a meaningful proportion of variation in costs: the adjusted R^2 values are 0.118 and 0.131, far below the range of 0.638-0.697 observed for the bad debt cost and top-down models. They perform no better than at PR19 and their inclusion would require Ofwat to significantly relax the model inclusion tests that it has set out.

112. Comparison of results across the three sets of models demonstrates that the other retail cost models fail to capture important drivers of cost. Ofwat's chosen scale variable in retail models, the number of household customers served, is consistently negative and significant in the top-down models in which it is included. In the other retail cost bottom-up models, however, it is insignificant. This is accompanied by adjusted R2 values that indicate these models account for less than a fifth of the variation that can be accounted for by other bottom-up or top-down models. Taken together, these statistics are consistent with the other cost model specification omitting important drivers of retail cost.

113. By contrast, the bottom-up models of bad debt costs perform better. They account for a reasonable proportion of variation in costs, and we agree with Ofwat's interpretation that the direction and magnitude of the sign on the average bill explanatory variable is plausibly consistent with the underlying business economics. We continue to note, however, that the variable suffers from endogeneity concerns.

114. The bad debt cost models collectively do not perfectly account for the impact of deprivation on company costs. Whilst the chosen variables appear relevant, the reality is that the impact of deprivation is more nuanced than can be captured in a single representative average variable. The proposed models may risk understating the impact of pockets of high deprivation - though placing greater weight on the two models (RTC1 and RTC2) that reflect the outcome of patterns of high deprivation, rather than averaging over those patterns, would mitigate this risk.

115. Ofwat's approach to controlling for customer characteristics is also somewhat inconsistent: having established the principle of a relationship between deprivation and cost to serve in the retail context, we would welcome recognition of other relationships elsewhere in the price control.[15]

116. We also have some concerns with the results of the bad debt cost models, specifically around the (very) wide range of resulting efficiency scores. It is not credible that the bad debt costs of the least efficient company, controlling for characteristics, are three times as high as those of the most efficient company. We return to this point in our discussion of how the model results will ultimately be interpreted.

Ofwat's total cost retail models

117. Turning to the top-down estimations, we agree with the inclusion of three of these in Ofwat's proposed set of models. Models RTC1-3:

- account for a reasonable proportion of variation in costs (taking into account the point that in modelling on a unit cost basis the impact of customer numbers on total costs at constant returns to scale has been stripped out);
- account for the clear and strong impact of scale effects on retail unit costs through the inclusion of household numbers as an explanatory variable; and

[15] For example, pockets of high affluence may make it more challenging to achieve a given low level of per capita consumption.

- account for bad debt costs using a functional form that has been cross-checked through bottom-up models.

118. This last point means that the three usable bottom-up models need not simply be discarded.

119. We do not consider there is any basis for omitting the number of customers as an explanatory variable in models RTC4-6. It is significant, has plausible sign and magnitude, and improves the explanatory power of the models as measured by the adjusted R2. For these reasons, we consider that Ofwat's own tests indicate that it should discard models RTC4-6 and use models RTC1-3 (cross-checked by the three bad debt cost models) as the primary basis for its decisions.

120. Finally, we have two further reservations regarding the use of these models to generate conclusions on relative efficiency, which we expect Ofwat will need to address in forming its Draft and Final Determinations.

121. Our first reservation is that the spread of modelled efficiency scores is wide and results are not robust. We have previously submitted models for consideration that generated comparable results in relation to Ofwat's tests but produced materially different conclusions for relative efficiency. In particular, our submitted total cost models produce a different picture, and perform well theoretically and empirically. There are no grounds to reject these total cost models from consideration entirely, and Ofwat should refer to them as it forms, triangulates and rationalises its conclusions.

122. Part of the reason for the spread of scores is that several drivers of efficient costs are not captured in Ofwat's top-down models:

- Serving metered customers involves costs that are not incurred for unmetered customers. Meter readings must be carried out, and these generate additional related contacts that have no equivalent for unmetered customers. Investments in metering are necessary to support delivery of industry outcomes, and the associated costs should be recognised.
- Beyond existing costs, investment in smart metering will require associated increases in outreach activity to customers to ensure that the benefits of smart meters are secured. These are currently absent from the proposed models.
- Other company-specific drivers of customer contacts and retail costs are omitted. For example, our obligation to soften water is a source of cost that other companies do not face.

123. We encourage Ofwat to take account of all available options in reacting to these challenges. Some can be addressed through cost adjustment claims (see discussion below). Others, however, might need to be considered 'in the round'. For example, although we disagree with aspects of the approach to modelling (or excluding) drivers such as deprivation, Covid-19 and metering, we do recognise the modelling challenges involved may make it impossible to derive a single, universally applicable model specification. Ofwat must recognise the limitations this places on its conclusions, and take into account the relative robustness of its results when calibrating the efficient benchmark and deriving companies' efficiency challenges (we return to this in comparing our AMP8 plan to a view of modelled efficient costs).

124. Our second reservation concerns the use of model results to generate representative conclusions for the PR24 forecast period. Several aspects of this will not be straightforward:

- We assume that PR24 cost forecasts will be based on the best available forecast for the relevant cost drivers. In particular, extrapolation of trends in average bills will not serve as a useful predictor of average bills in PR24. Ofwat's approach should accommodate innovative tariffs.

- Cost assessments will be very sensitive to the treatment of inflation. We maintain our view that retail costs should be indexed to inflation, not least due to the direct impact of bill inflation on costs as recognised in Ofwat's proposed bad debt and total cost models. Ofwat must also recognise the recent and ongoing period of very high inflation, and ensure that model results are accurately translated from the 2017/18 real price base into a fully cost-reflective price base for the purpose of calculating allowances (see discussion below).
- In taking account of forecast data and inflation, we recommend that Ofwat learns from the experience of generating PR19 allowances. Outturn inflation proved to be significantly higher than expected and forecast reductions in cost did not generally materialise. In the UK, periods of high inflation have tended to deviate further from the Bank of England's 2% target than periods of low inflation. Ofwat should take this asymmetry into account either through indexation or through a specific allowance, as we discuss further below.
- The dummy variables included for years affected by Covid-19 are consistent with the significant cost pressures that the industry has faced. Ofwat must remain open to the possibility that these pressures remain present in PR24 - whether because some Covid-related challenges remain or because the dummy variables capture wider economic challenges.

Ofwat’s proposed inclusion of Covid-19 dummy variables in the retail cost models

125. As we noted in our April consultation response, we welcome Ofwat’s recognition of the industry-wide impact of Covid-19 on the water sector. The Covid-19 pandemic precipitated a major shift in our internal business operations and in the ways that we engage with our consumers. The Covid-19 pandemic also generated a simultaneous increase in companies’ input prices and increased bad debt provisions.[16] Ofwat’s inclusion of Covid 19 dummies in the residential retail cost models testifies to the industry-wide impacts of the pandemic.

126. While we welcome Ofwat’s recognition of this impact, we suggest that further analysis is required to understand the interaction between the Covid-19 dummy variables and wider trends experienced across the water sector. In particular, lingering effects from the pandemic have endured beyond the period covered by the Covid-19 dummies (2019/20 and 2020/21). Input prices have not returned to their pre-pandemic trend levels, lasting health impacts from Covid-19 on SES employees endure, while consumer bad debt levels remain elevated.

127. In this context, we consider that the appropriateness of the Covid-19 dummies will depend on how they are used to set future cost allowances within the overall PR24 assessment framework. Forecasting costs with the coefficients on the Covid-19 dummies set equal to zero risks making an unrealistic assumption that there are no lingering industry-wide pressures from Covid-19 (or from other common factors that emerged during 2019-20 and 2020-21). At the other extreme, forecasting costs including the dummy coefficients from the historic models, risks overstating any impact lasting into PR24.

128. We therefore support the use of the Covid-19 dummy variables subject to the caveat that it is recognised that it may not be possible to calculate future cost allowances mechanistically using fixed dummy variable parameters. The use of the Covid-19 dummies for PR24 will require a more nuanced reading of both the historical data and of

[16] See specific discussion of this issue within our own cost base in Chapter 7 of the main plan.

the likely evolution of industry-wide factors that emerged during the period from 2019/20 to 2020/21.

129. This further supports the approach that we have taken in looking at how our forecast retail expenditure in the next AMP might compare to Ofwat's benchmarks in the round, as opposed to taking an overly mechanistic approach to the assessment, given the issues that a requirement for Covid-19 dummies helps to demonstrate.

How we have taken account of the issues with Ofwat's retail cost models

130. As noted in Chapter 7 of the main plan, Ofwat has guided us to assume that individual models within its retail cost modelling suite are equally weighted in its modelling of efficient costs. We have sought to build upon and test the efficiency of our business plan costs as far as possible consistently with Ofwat's published models and guidance. However, as we have set out above, we have a number of material concerns with Ofwat's proposed retail cost models and so for the purposes of benchmarking our business plan costs we have applied a series of adjustments to the equally weighted results of Ofwat's modelling. This includes:

- Our cost adjustment for economies of scale, related to how Ofwat capture the impacts of scale of operations across its suite of retail cost models.
- A symmetrical adjustment for population transience on retail costs as evidenced in Affinity Water's early base cost adjustment claim.

131. As noted above, we also taken into account our assessment of Ofwat's retail cost model in judging what is an appropriate efficiency benchmark for our retail expenditure. Ofwat's proposed approach has been to set a benchmark based on the upper quartile company's performance. Given the material issues we have identified with the proposed retail cost models for PR24 – see above – and the exceptionally wide range of modelled efficiency scores, we consider there is a risk that an upper quartile benchmark would provide a misleading picture of efficient costs at PR24. While part of the variation between companies undoubtably reflects differences in efficiency, part of it simply reflects modelling uncertainty.

132. Therefore, we consider the choice of benchmark for the retail cost modelling should reflect that and we consider there is a strong case for Ofwat adopting a less stringent benchmark than was applied at the PR19 Final Determinations.

Projecting the allowance within Ofwat's benchmarking models

133. We have followed broadly the same approach as for wholesale to benchmark our outturn costs (2022/23) and our forecast business plan expenditure. This has involved the steps set out below.

134. We compare our outturn costs against Ofwat's efficient modelled costs once some of the factors that are not accounted for in Ofwat's models are addressed (i.e., the cost adjustment claims) to determine the size of the efficiency gap (if any) between the modelled efficient costs and our outturn costs and whether there may be one-off factors that explain this result.

(i) We account for the expected impacts of any growth in retail cost drivers going into AMP8 and how this impacts efficient modelled costs.

(ii) We adjust for expected input cost pressures and scope for ongoing efficiency in AMP8 to update the efficient modelled costs.

135. In the table below, we show our modelled costs, once adjusted for our cost adjustment claims, against our actual expenditure for the most recent outturn year

(2022/23) and how this compares against the upper-quartile efficient costs based on a 0.90 upper-quartile efficiency score.

Table 13: Comparison of 2022/23 outturn retail modelled base expenditure against Ofwat's modelled estimates, including SES adjustments (£m, 2022-23 prices)

	2022-23
Outturn retail expenditure (A)	**8.1**
UQ efficient costs based on full set of benchmark models (B)	5.9
Retail scale cost adjustment claim (C)	0.5
Population transience symmetric adjustment (D)	0.2
Adjusted estimate of efficient costs (E = B + C + D)	**6.7**
Variance (F = A – E)	**1.4**

Source: SES Water analysis of Ofwat published base cost models

136. The justification for the retail scale and population transience adjustments to Ofwat's efficient modelled costs are summarised in subsections below. Overall, this comparison appears to show that our retail costs are above what might be considered the efficient benchmark cost. Specifically, the gap between out actual costs in 2022/23 and Ofwat's modelled costs is 17% applying an upper quartile level efficiency benchmark and the impact of the two cost adjustments in the modelling.

137. In practice, we consider there are a number of reasons to conclude that this comparison is not a true reflection of our underlying efficiency or the efficiency challenge that we might reasonably be expected to integrate in our cost forecasting looking forward into the next AMP:

- As we explain in Chapter 7, the Covid-19 pandemic imposed additional costs – in particular in relation managing bad debt costs. While we expect that some of these cost pressures may be enduring (see discussion above in relation to Ofwat's treatment of the Covid-19 dummy variables) we expect a falling provision for bad debt which will naturally close some of the expected gap to modelled costs based on Ofwat's current base cost models.
- We have noted above the material issues with Ofwat's retail cost models and the observed gap to our 2022/23 outturn costs cannot, therefore, be robustly attributed to inefficiency.
- We continue to expect further efficiencies from our retail cost base from the adoption and rollout of new technologies and processes, as detailed in Section E below.

138. As a result, we did not explicitly introduce an efficiency challenge in our forecast business plan expenditure for AMP8 given the findings of the 2022/23 benchmarking. However, we remained mindful of the conclusions of this analysis and our view that the models themselves may not provide at an upper quartile level benchmark, and may not provide a robust view of our efficient expenditure.

Cost adjustment claim for retail scale

139. For the reasons set out above, we do not consider that Ofwat has appropriately captured the impact of economies of scale within its suite of models.

140. In its base cost model consultation, Ofwat has proposed several models for the retail sector. Three of Ofwat's retail models do control to a degree for economies of scale. Ofwat's own model selection criteria show that these models are superior to others that do not. We, therefore, have submitted a cost adjustment claim on the basis that placing equal weight on models that do not control for this effect would fail to remunerate our efficient costs.

141. Given that a selection of Ofwat's own retail models include scale variables, we consider that Ofwat itself recognises that scale impacts are a valid reason for variation in efficient costs. Therefore, where the impact of economies of scale are not controlled for directly in Ofwat's models – which as noted above is the case for several of the retail models that were recently consulted on – we consider it is both fair and valid that an additional cost adjustment claim would be permitted to account for this.

142. There are consumer benefits from SES Water's relatively small-scale, local retail operations even though this increases our efficient costs of operation. We are able to better understand, and pay greater attention to, local stakeholder and our customer requirements, and maintain operations, such as our local call centre, that are highly valued by our customers because they provide a bespoke and locally focused service that results from the company serving a relatively small supply area.

143. Our submitted cost adjustment claim is aligned from the early submission we made back in May, but has been updating to reflect our forecasts for each of the cost drivers over AMP8. Therefore, our claim for an addition to Ofwat's equally weighted modelled costs is £4.1m over AMP8, or £0.8m p.a. in 2022/23 prices. The detailed claim is provided in Appendix SES030. As we note in that appendix, the size of the claim is dependent on the final selection of models by Ofwat. Should it adopt the top-down retail models with the scale variable, then the size of our claim would fall to zero given the impacts would be accounted for in the top-down models.

Symmetric adjustment for retail transience

144. As discussed in Chapter 7 of the main business plan, we have reviewed the CACs submitted by Thames Water and Affinity Water in relation to the transience of their respective populations – i.e., the propensity of people to migrate between addresses, both within the UK ('internal transience') and internationally ('international transience'). We are supportive of those claims and the impacts they evidence of higher population transience[17] on debt and non-bad debt related retail costs.[18]

145. While we recognise the effect of population transience does not meet Ofwat's materiality threshold for SES Water, it does have a material effect on the size of our efficiency gap, accounting for approximately 9% of the gap. We have, as a result, accommodated the (symmetrical) impact of the transient population CAC on our costs as estimated in Thames and Affinity Water's early CAC in our efficiency benchmarking. This adds £0.2m p.a. to our efficient modelled costs in AMP8.

[17] i.e., the propensity of people to migrate between addresses, both within the UK ('internal' transience), and internationally ('international' transience).

[18] As discussed in Economic Insight's report for Affinity Water, debt related costs are higher with increased transience because the more customers relocate, the 'harder' it is to recover debt from them. Non-bad debt related costs (other costs) increase with transience because when customers move address, companies need to 'process' that change of address. See Economic Insight (2023): 'Cost Adjustment Claim to fund additional retail costs from transience'.

Real price effects and ongoing efficiency

146. As described in Chapter 7 of the main business plan, for the purposes of testing the efficiency of our AMP8 forecast retail costs, we have assumed in our efficient (benchmarked) modelled costs that:

- Labour costs will rise by the current wage rate forecast by the OBR.
- Other retail costs will rise with expected CPIH.
- We will be able to maintain a 1% per annum productivity improvement, which will partially offset the increase in costs.

147. If Ofwat does not index the retail cost to serve allowance (a policy for the reasons set out in Chapter 7, we do not support), we consider these assumptions should form the basis for Ofwat setting fixed ex ante allowances.

148. In summary, we consider the assumptions justified because:

- A substantial part of our retail cost base are salaries which over the medium term can be expected to rise at least with general inflation, but likely at a higher rate given the location of our business and the competition we face with other local water businesses (Thames, Southern, and Affinity) to attract and retain staff.
- Several elements of our retail costs are directly related to inflation (e.g., business rates and Ofwat's own license fees).
- Many of our costs are directly related to the size of the bill – which are dominated by wholesale charges, which are themselves directly linked to inflation.
- There are a number of known opportunities to employ new data, technology and artificial intelligence to aid and improve productivity / efficiency within our retail business, and for this reason, we have adopted a 1% ongoing efficiency target in our plan and the efficient modelled cost benchmark, even though this is above the range that has been suggested in a recent published study for other water companies of the scope for frontier shift in water sector retail in PR24.[19]

149. Consistent with wholesale, the 1% per annum is reflected in our business plan costs from the start of AMP8 when the efficiency savings can start to be realised against out AMP7 budgeted costs. Consistent with how we understand Ofwat may apply the frontier shift challenge in its modelling, our efficient modelled cost benchmark for retail expenditure applies the 1% target from a 2022/23 base year.

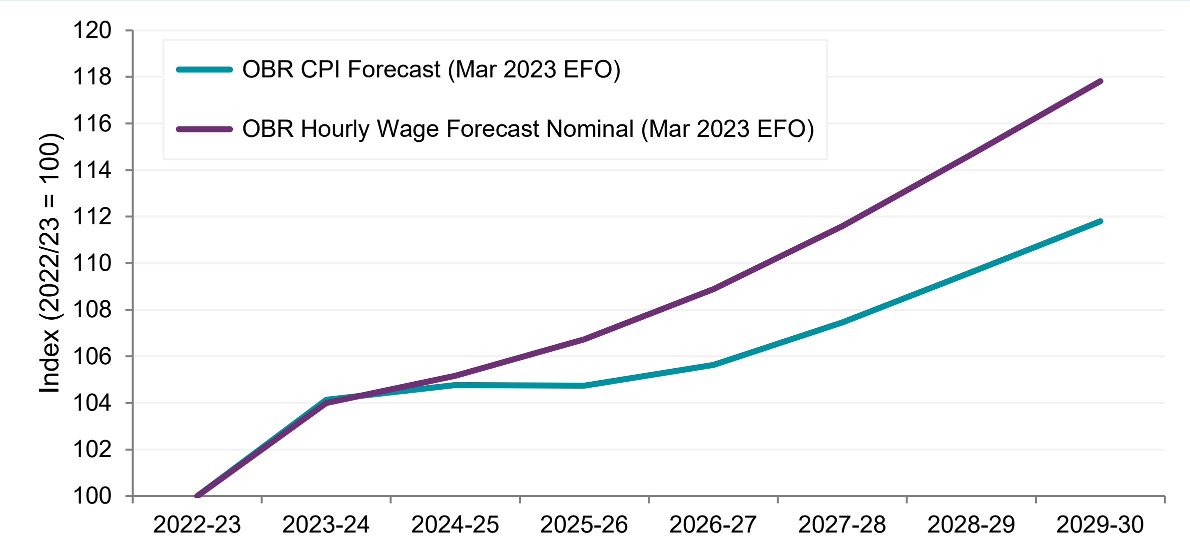
150. The box below provides the supporting information and evidence that has informed our assumptions on labour costs in our cost modelling.

[19] See Economic Insight (2023): 'Frontier Shift at PR24', Economic Insight conclude "*Our analysis* [of the scope for frontier shift] *for retail suggests: (i) a 'plausible range' of 0.3%-0.6%; (ii) a 'PR24 focused range' of 0.4%-0.6%; and (iii) a 'sensitivity analysis range' of -0.2%-1.2%. Overall, these ranges are highly similar to those for the total water value chain; but note that the upper ends of our 'plausible range' and 'PR24 focused range' are slightly lower for water retail. This is consistent with intuition, whereby we would characterise retail activities as being somewhat more 'vanilla'; with lower value add; lower capital intensity; and (therefore likely) lower scope for technological change that could, in turn, drive improved productivity.*"

Box 2: Input price pressures affecting our retail business.

Labour costs make up a material proportion of our retail cost base, ranging between 55% and 60%. Across the industry staff costs make up approximately 45% of residential retail costs. This covers costs associated with dealing with customer queries as well as meter reading.[20] Our move towards smart metering will reduce some of the meter reading costs, though we expect that as the proportion of households that are metred increases, the number of customer contacts will also increase.

In the chart below, we show the latest forecast from the OBR on growth in hourly wages over the period 2022-23 to 2027-28 (extrapolating linearly from there).



We consider it more appropriate to separately capture the effect of real wage increases and the effect of productivity (through the ongoing efficiency assumption) rather than assuming they offset each other in all circumstances. In fact, over the AMP8 period, the OBR wage forecast coupled with a 1% ongoing efficiency assumption implies a real reduction in our retail cost base.

Source: SES Water analysis

Comparing against our AMP8 plan

151. Our retail business is on a transformation pathway to improve its efficiency. It is also expected to play a strategic role in delivering on our performance commitments in AMP8, and in particular, in supporting demand management and water efficiency targets (e.g., PCC reduction). On that basis, we have concluded that an upper quartile efficiency benchmark is an appropriate, and stretching, efficiency challenge for our business in AMP8, particularly given the 1% p.a. ongoing efficiency target we have reflected in our cost forecasts. However, we can only reach a definitive view on the appropriate benchmark level for retail costs in PR24 once we have reviewed Ofwat's modelling proposals at draft determinations. And specifically, whether Ofwat adopts our proposals to rely on the top-down benchmark models rather than triangulating across both the top-down and bottom-up models.

152. In the table below, we show our efficient modelled retail costs, applying an upper quartile efficiency challenge, once adjusted for growth in retail cost drivers, cost

[20] See Figure 7 in Economic Insight (2017) Household retail input price inflation at PR19

adjustment claims, input price pressures (RPEs) and ongoing efficiency, compared to our forecast AMP8 business plan expenditure.

Table 14: Forecast retail modelled base expenditure against Ofwat's modelled estimates, including SES adjustments (£m, 2022-23 prices)

	2025/26	2026/27	2027/28	2028/29	2029/30	AMP8
Business plan costs (A)	**7.2**	**7.3**	**7.2**	**7.1**	**7.1**	**35.9**
UQ efficient costs from benchmark models (B)	6.3	6.5	6.6	6.7	6.9	**33.0**
Retail economies of scale CAC (C)	0.7	0.8	0.8	0.9	0.9	**4.1**
Retail population transience adjustment (D)	0.2	0.2	0.2	0.2	0.2	**1.0**
RPEs (E)	0.1	0.1	0.2	0.2	0.2	**0.8**
Ongoing efficiency (F)	-0.2	-0.3	-0.4	-0.5	-0.6	**-1.9**
Adjusted estimate of efficient costs (G = B + C + … + F)	**7.1**	**7.2**	**7.4**	**7.5**	**7.7**	**36.9**
Variance (H = A - G)	**0.2**	**0.0**	**-0.2**	**-0.4**	**-0.6**	**-1.0**

Source: SES Water analysis of Owat published base cost models

153. As we conclude in Chapter 5 of the main business plan, given the range of modelling decisions and uncertainties that still exist with Ofwat's retail cost benchmarking, in the round we consider our forecast plan costs to be efficient. As we have noted above, we continue to have some significant concerns with aspects of Ofwat's proposed retail cost modelling framework, and for this reason would highlight the comments and suggestions we have raised above (see 'Our view of Ofwat's benchmarking models') which we would hope to be considered ahead of Ofwat finalising its short-list of models for its draft and final determination process.

E. Ensuring the efficiency of our plan for AMP8

154. In this section we out the initiatives that we will take in the next AMP to deliver our efficient expenditure plans for the PR24 price control period.

Ensuring the efficiency of our wholesale expenditure

155. To ensure the efficiency of our wholesale expenditure we are employing new and innovative data processes, technologies and use of artificial intelligence. For us to deliver more of what matters to our customers, improve the environment we depend upon, address future challenges and become more effective and efficient, we need to innovate. We have a long track record of innovation in our industry and a strong company culture which values and promotes innovation.

156. Our size has allowed us to take a leading role in developing new solutions that benefit both our customers and the environment. This is why we have consistently delivered upper quartile or industry-leading performance in a number of areas:

- SES Water is the first UK water company to roll out intelligent technology across its entire water distribution network. The self-learning network highlights issues in near real-time so action can be taken more quickly to make sure customers continue to receive an uninterrupted supply of safe, high quality drinking water, and paves the way for us to more than halve our leakage by 2045.
- Without this use of technology our ambitious leakage targets would be harder and more costly to achieve. We have set out in Chapter 7 and our LTDS, how we propose to extend the roll out of our smart programme to production sites in the next AMP which is a central part of our strategy to improve asset performance and management at WTWs but also deliver operational cost efficiencies.

157. **Efficient procurement and strategic tendering.** We are committed to ensuring that we adopt effective approaches to procuring services. We currently maintain a strategic relationship with our primary contractor Clancy Docwra but regularly look to market test the delivery of works and make sure that we build in contractual protections against key cost risks where external parties are contracted to deliver works. Through developing our capital programme for AMP8, we have identified a number of opportunities to drive value for our customers as we retender for a series of strategic contracts and look to approach the market at opportune times.

158. **Efficient management of purchased inputs.** We have a series of procurement exercises over the coming years as various contracts for energy and chemicals come to an end. We will manage these programmes strategically and carefully monitor prices to ensure that we go to market at the most opportune time as possible, while also managing the price risks that we face in sourcing these key inputs.

159. **iDMA driven savings.** We expect to be able to drive further cost efficiency savings from our iDMA in terms of quicker identification and resolution of issue (e.g., from shorter leakage run-times as a result of getting to the incidence quicker).

160. **Employing best practices in the ongoing project governance and cost envelope management for our key enhancement schemes.** This particularly applies to our proposed smart-meter rollout programme. We have put forward our current best estimate of what this programme will cost to deliver for our customers. Through effective supply chain management and governance of the programme in its actual delivery, we will endeavour to drive further efficiencies for customers, both in terms of the upfront capital spend and in the ongoing operating costs necessary to the deliver the benefits from this strategic part of our investment programme.

Ensuring the efficiency of our retail plan

161. We are seeking further process, volume and outsourcing improvements in our retail business. We have identified a series of opportunities to drive cost efficiencies in our retail business going into the next AMP including:

- Actions to reduce the volume of activity our business needs to manage on a day-to- day basis through reduced billing queries (by increased billing accuracy from Aptumo, smart metering data and introducing new end-to-end processes with our customers)
- Achieve channel shift (i.e., encouraging customers to interact with our retail water business via an expanded set of channels including the new proposed customer App and Omni channel marketing) which will over time help us reduce our operating costs by again reducing queries and the need for repeated contacts
- Automating our processes with smart meter data and technologies. This will enable us to implement an automated customer journey with less manual handing and shortened customer handling times that will help to reduce costs
- Further internal staff training and education initiatives to reduce the time and need for repeat contacts, and the integration of customer data, via the Aptumo systems, that we have invested in during AMP7
- During the current AMP we have outsourced aspects of our retail functions to South Africa. While we will continue to retain a local presence that is connected with our local community, we will continue to explore if there are strategic opportunities for outsourcing to help drive efficiencies
- Integration of customer data into a single source, to enable us to respond quicker and more effectively to customer queries, and
- Benefits from smart metering including reduced complaints from bill accuracy, estimated reads and better consumption management.[21]

[21] We expect these impacts to also spill over into benefits for our wholesale business.

Annex A: Detailed assumptions and results

Wholesale base cost models with electricity price index as an explanatory variable

	WRP1	WRP2	WRP3	WRP4	WRP5	WRP6	TWD1	TWD2	TWD3	TWD4	TWD5	TWD6
Connected properties (log)	1.074*** {0.000}	1.074*** {0.000}	1.057*** {0.000}	1.060*** {0.000}	1.028*** {0.000}	1.028*** {0.000}						
Water treated at complexity levels 3 to 6 (%)	0.004*** {0.009}		0.003** {0.044}		0.004*** {0.006}							
Weighted average density - LAD from MSOA (log)	-1.473** {0.012}	-1.425** {0.038}					-2.619*** {0.000}			-2.877*** {0.000}		
Weighted average density - LAD from MSOA (log) squared	0.091** {0.014}	0.088** {0.046}					0.211*** {0.000}			0.222*** {0.000}		
Energy Price Index (log)	-0.19 {0.359}	-0.194 {0.282}	-0.208 {0.308}	-0.21 {0.241}	-0.211 {0.298}	-0.213 {0.229}	-0.259*** {0.009}	-0.229** {0.019}	-0.202** {0.040}	-0.243** {0.011}	-0.218** {0.019}	-0.197** {0.048}
Weighted average treatment complexity (log)		0.261 {0.240}		0.226 {0.332}		0.278 {0.200}						
Weighted average density – MSOA (log)			-4.945** {0.023}	-5.055** {0.039}				-5.391*** {0.000}			-6.375*** {0.000}	
Weighted average density – MSOA (log) squared			0.299** {0.023}	0.305** {0.039}				0.380*** {0.000}			0.434*** {0.000}	
Properties per length of mains (log)					-7.166** {0.042}	-6.987* {0.060}			-14.357*** {0.000}			-16.073*** {0.000}
Properties per length of mains (log) squared					0.777* {0.058}	0.753* {0.081}			1.826*** {0.000}			1.988*** {0.000}
Length of mains (log)							1.065*** {0.000}	1.024*** {0.000}	1.069*** {0.000}	1.058*** {0.000}	1.016*** {0.000}	1.044*** {0.000}
Booster pumping stations per length of mains (log)							0.454*** {0.003}	0.410*** {0.002}	0.465*** {0.002}			
Average pumping head TWD (log)										0.337*** {0.000}	0.393*** {0.000}	0.341*** {0.000}
Constant	-5.470*** {0.000}	-5.660*** {0.003}	9.395 {0.246}	9.79 {0.288}	5.775 {0.429}	5.37 {0.488}	3.807** {0.018}	15.002*** {0.005}	23.904*** {0.000}	1.781 {0.259}	16.061*** {0.000}	25.084*** {0.000}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R^2	0.908	0.901	0.9	0.895	0.909	0.904	0.956	0.954	0.959	0.962	0.965	0.966
RESET P-Value	0.806	0.727	0.911	0.854	0.698	0.578	0.555	0.402	0.709	0.695	0.927	0.771

	WW1	WW2	WW3	WW4	WW5	WW6	WW7	WW8	WW9	WW10	WW11	WW12
Connected properties (log)	1.069***	1.061***	1.055***	1.050***	1.043***	1.037***	1.063***	1.058***	1.045***	1.042***	1.025***	1.021***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Water treated at complexity levels 3 to 6 (%)	0.002**		0.002		0.002**		0.002		0.001		0.002*	
	{0.026}		{0.133}		{0.022}		{0.117}		{0.357}		{0.085}	
Weighted average density - LAD from MSOA (log)	-1.751***	-1.615***					-2.052***	-1.962***				
	{0.001}	{0.002}					{0.000}	{0.000}				
Weighted average density - LAD from MSOA (log) squared	0.124***	0.114***					0.139***	0.132***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Energy Price Index (log)	0.239*	0.211	0.247*	0.222*	0.235*	0.206	0.234*	0.216*	0.254**	0.236**	0.241*	0.219*
	{0.088}	{0.107}	{0.076}	{0.087}	{0.088}	{0.113}	{0.075}	{0.070}	{0.050}	{0.046}	{0.070}	{0.073}
Weighted average treatment complexity (log)		0.268**		0.224*		0.274**		0.203		0.152		0.222*
		{0.024}		{0.071}		{0.017}		{0.122}		{0.242}		{0.072}
Weighted average density – MSOA (log)			-4.692***	-4.403***					-6.010***	-5.851***		
			{0.002}	{0.003}					{0.000}	{0.000}		
Weighted average density – MSOA (log) squared			0.299***	0.280***					0.373***	0.363***		
			{0.001}	{0.002}					{0.000}	{0.000}		
Properties per length of mains (log)					-10.721***	-10.086***					-12.008***	-11.564***
					{0.000}	{0.000}					{0.000}	{0.000}
Properties per length of mains (log) squared					1.248***	1.169***					1.372***	1.318***
					{0.000}	{0.000}					{0.000}	{0.000}
Length of mains (log)												
Booster pumping stations per length of mains (log)	0.443***	0.431***	0.474***	0.460***	0.348**	0.331**						
	{0.007}	{0.006}	{0.005}	{0.005}	{0.045}	{0.047}						
Average pumping head TWD (log)							0.331***	0.325***	0.340***	0.336***	0.269**	0.261**
							{0.002}	{0.003}	{0.003}	{0.003}	{0.030}	{0.040}
Constant	-3.329**	-3.810**	9.241	8.097	13.514**	12.165**	-5.078***	-5.355***	11.715**	11.126**	14.357***	13.468***
	{0.028}	{0.013}	{0.106}	{0.157}	{0.015}	{0.024}	{0.006}	{0.003}	{0.020}	{0.035}	{0.001}	{0.001}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R^2	0.965	0.966	0.963	0.965	0.965	0.967	0.965	0.965	0.962	0.963	0.966	0.966
RESET P-Value	0.567	0.367	0.604	0.384	0.517	0.257	0.966	0.96	0.955	0.979	0.842	0.741

Source: SES Water analysis

Annex B: Forecasts of cost drivers, real price effects and ongoing efficiency

Producing a hybrid electricity price index using data from DESNZ and forecasts from Cornwall Insights

In the table below, we present the hybrid electricity price index used as a cost driver in our adjusted base cost models:

- **Historic data:** We use data from DESNZ on industrial electricity prices for historic data on energy costs up to 2022-23.[22] As electricity forms most of our energy expenditure, we consider it more appropriate and simpler to use data on electricity prices rather than to construct a composite index. The data from DESNZ represents an industry average hedged position, and is presented as an index.
- **Forecasts:** We use forecasts from Cornwall Insight on spot electricity prices including fixed costs from 2023-24 onwards. Based on our expected consumption pattern, this has been turned into a unit rate.
- **Combined series:** We use another dataset from DESNZ on quarterly energy prices, to estimate the average unit price in Q1 2023 for an industrial consumer of our scale. Based on this information, we have converted the DESNZ price index into a series of actual electricity prices. We have then combined this with the Cornwall Insight forecast to provide a full series. Implicitly, in this series, we are assuming that from 2023-24 onwards, either (a) spot rates are broadly aligned with average hedged prices or (b) most industry hedges have expired.

Table 15: Assumed trajectory of electricity prices

	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30
DESNZ Industrial Electricity Price Index (2010 = 100)	152.4	157.7	180.8	277.2							
DESNZ Implied Electricity Price (£/MWh, nominal)	100.8	104.3	119.6	183.3							
Cornwall Insight Forecast (£/MWh, nominal)				431.7	229.9	236.0	217.9	211.0	196.7	192.0	227.5
Hybrid series (£/MWh, nominal)	100.8	104.3	119.6	183.3	229.9	236.0	217.9	211.0	196.7	192.0	227.5
Hybrid series (£/MWh, 2022-23 prices)	114.5	117.6	130.1	183.3	215.8	220.2	203.3	195.3	178.9	171.6	199.9

Source: DESNZ, Cornwall Insight, SES Water

Note: The Cornwall Insight Forecast has been converted between nominal and real using the Cornwall Insight inflation forecast rather than the forecast used elsewhere

[22] DESNZ (2023) Energy Prices, Non-Domestic Prices, Fuel price indices for the industrial sector. Table 3.3.2 Fuel price indices for the industrial sector, including CCL, quarterly, United Kingdom, Unadjusted: Electricity (Current fuel price index numbers). Available at: https://www.gov.uk/government/statistical-data-sets/industrial-energy-price-indices

Forecasts of cost drivers

Table 16: Forecast of cost drivers used in Ofwat wholesale base cost models

	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Number of connected properties	301,753	303,769	305,799	307,842	309,899	311,970	314,055	316,153
Lengths of main (km)	3,528	3,535	3,543	3,551	3,558	3,566	3,574	3,582
Water treated at complexity levels 3 to 6 (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Weighted average treatment complexity	4.96	4.95	4.94	4.93	4.92	4.91	4.90	4.89
Number of booster pumping stations	33	33	33	33	33	33	33	33
Average pumping head – TWD (metres per head)	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.9
Weighted average density – LAD from MSOA	2,389	2,407	2,425	2,444	2,462	2,481	2,499	2,518
Weighted average density – MSOA	3,235	3,265	3,295	3,325	3,355	3,386	3,417	3,448
Booster pumping stations per length of mains	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Properties per lengths of main	86	86	86	87	87	87	88	88

Source: SES Water

Table 17: Forecast of other cost drivers used in adjusted wholesale base cost models and cost adjustment claim models

	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Electricity price index (2011-12 = 100, real)	127.0	130.4	144.2	203.3	229.7	234.3	216.4	207.8
Distribution input	164.6	165.3	165.9	166.6	167.2	167.9	168.6	169.2
Average pumping head – WR (metres per head)	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9
Average pumping head – WRP (metres per head)	78.5	78.5	78.5	78.5	78.5	78.5	78.5	78.5
Average pumping head – WW (metres per head)	167.4	167.4	167.4	167.4	167.4	167.4	167.4	167.4
Weighted average weekly regional wage (£, 2017/18 prices)	665.7	665.7	665.7	665.7	665.7	665.7	665.7	665.7

Source: SES Water

Table 18: Forecast of other cost drivers used in retail models

	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Total number of households	276,913	279,422	281,488	283,448	286,093	288,759	290,970	293,072
Equifax - Insight Postcode Event - % of households with default	19.98	19.98	19.98	19.98	19.98	19.98	19.98	19.98
Equifax - Average number of Partial Insight accounts or county court judgements per household	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
Combined Income Score for England and Wales (IMD) - interpolated	8.23	8.23	8.23	8.23	8.23	8.23	8.23	8.23
Proportion of dual households (%)	-	-	-	-	-	-	-	-
Average bill size (£ per household)	172	177	182	188	193	199	205	211

Source: SES Water

Real price effects and on-going efficiency

Table 19: Forecast of real price effects and on-going efficiency assumptions (for the purposes of efficiency modelling)

Year-on-year percentage change (%)	Wholesale weighting	Retail weighting	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Labour	43%	57%	-0.1%	0.5%	1.5%	1.2%	0.7%	0.7%	0.7%
Electricity (input into benchmarking model)	16%	-	13.0%	2.0%	-7.6%	-4.0%	-8.4%	-4.1%	16.5%
Chemicals / Materials / Other	40%	43%	-	-	-	-	-	-	-
Electricity (output from model)	100%	N/A	3.1%	0.5%	-2.0%	-1.0%	-2.2%	-1.1%	3.9%
Ongoing efficiency assumption	100%	100%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

Source: SES Water

Table 20: Forecast of real price effects and on-going efficiency assumptions (for the purposes of business plan forecasting)

Year-on-year percentage change (%)	Wholesale weighting	Retail weighting	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Labour	43%	57%	-	-	-	-	-	-	-
Electricity	16%	-	-	-	88.3%	-4.0%	-8.4%	-4.1%	16.5%
Chemicals	5%	-	-	-	-	-	-	-	-
Materials	21%	-	-	-	-	-	-	-	-
Other	15%	43%	-	-	-	-	-	-	-
Ongoing efficiency assumption	100%	100%	-	-	1.0%	1.0%	1.0%	1.0%	1.0%

Source: SES Water

APPENDIX
SES005
C. ENERGY COSTS

Contents

APPENDIX SES005: C. ENERGY COSTS

This appendix sets out how we have approached forecasting of our energy costs in our business plan expenditure. We set out the key challenges that we face in forecasting our energy costs in AMP8 given the continued volatile energy market and the uncertainty of when it would be prudent to recontract for our energy needs and the appropriate length of contract(s) to put in place. We also summarise our views of how Ofwat should approach the treatment of energy costs in setting its PR24 price controls.

A. Introduction

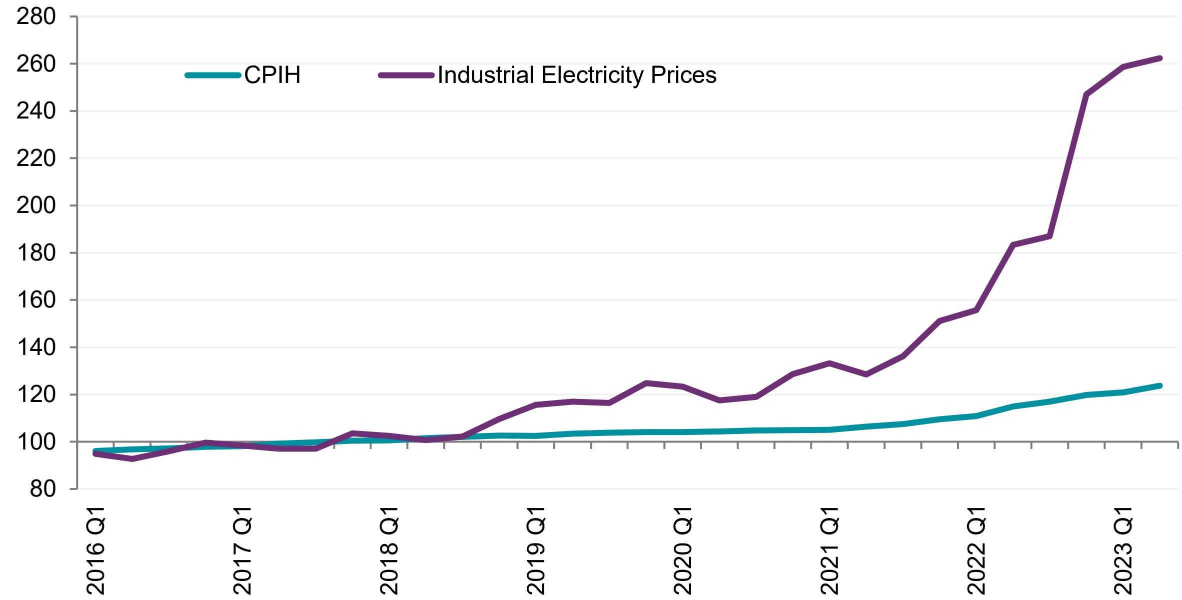
1. This appendix sets out the assumptions and key considerations that have informed the energy cost forecast we have included in our business plan expenditure. It sets out the key challenges that we and others in the industry face in forecasting our energy costs looking forward into the next AMP and our initial views on how Ofwat should consider the treatment of energy costs in setting its price controls.
2. The rest of this appendix is structured as follows:
   - Section B sets out the context leading into AMP8.
   - Section C sets out the challenges that we face in forecasting energy costs in AMP8.
   - Section D sets out the assumptions that we have made on energy costs.
   - Section E summarises our views of treatment of energy costs in our price controls.

B. Context leading into AMP8

3. AMP7 has seen a period of very significant volatility in energy markets and significant increases in wholesale prices. Figure 1 below plots the Department for Energy Security and Net Zero's (DESNZ) industrial electricity price index next to the ONS' CPIH consumer price index.
4. While there has been a significant increase in prices, a number of companies within the industry, including ourselves, have been partially protected from these price rises by managing energy costs through hedging arrangements, long-term offtake contracts and investment in self-generation (for example, a number of water companies have invested very heavily in solar generation).[1]
5. We have been less affected by some of price pressures as other water companies due to our energy cost hedges initiated early in AMP7. However, due to the nature of our land footprint, which limits the extent of self-generation that we can invest in, we have limited protection from the risks of sourcing our power from the energy market from self-generation. We are however, continuing to explore possible opportunities in this area and will continue to do so in AMP8.

[1] As referenced in Ofwat's letter to Regulatory Directors dated 11 August – 'Approach to energy cost forecasts in PR24'

Figure 1: Industrial electricity prices and CPIH, 2017-18 = 100



Source: SES Water analysis of DESNZ and ONS data

C. AMP8 forecasting challenges and uncertainties

6. While the energy hedges that we prudently entered into have protected us against price rises in the last few years, we will need to recontract for our energy for AMP8 which means we are exposed to market volatility and face a number of challenges that we will need to carefully manage leading into the AMP.

7. As we discuss in Section 7 – 'Explaining our costs', we do not believe it would be prudent or efficient to contract for our energy at current market price levels and as a result, our expected energy costs are by necessity uncertain and currently an estimate at this stage of the business planning cycle. We face a series of strategic decisions linked to:

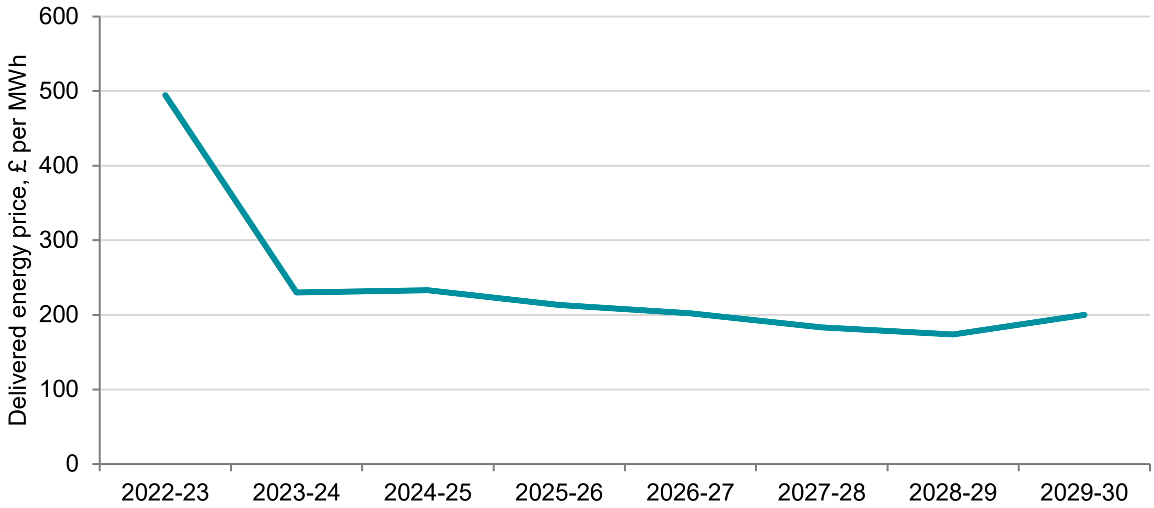
   - When we recontract for our energy, and
   - The prudent length of contract(s) to enter into.

8. We have commissioned independent analysis from Cornwall Insight of the expected forward energy price curve for AMP8 and beyond, and the resultant impact on the prices we can expect to pay.

9. The advice from Cornwall Insight indicates that energy prices have increased substantially in the past two years but are expected to eventually fall back from their current exceptionally high levels (see Figure 2 overleaf – a breakdown of this delivered energy price project is provided in Annex A to this appendix). There is, however, considerable uncertainty of the direction of future prices and when would be the opportune time to recontract for our energy in the next few years, and for how long this new contract (or contracts) should be for.

10. Our current estimate is that our likely consumption going into AMP8 will be approximately 50,000 MWh p.a. across the portfolio of our meter supply points. We have indicatively used this assumption to produce a forecast of our future energy costs alongside a Cornwall Energy forecast of the weighted average delivered energy price (2023/24 real) for the five years of AMP8, as set out in the next subsection.

Figure 2: Delivered £/MWh price, portfolio weighted average[2], 2023/24 prices



Source: Cornwall Insight & SES Water analysis

D. Our assumptions on energy costs

11. As we set out Chapter 7 of the business plan and above, we do not consider it would be prudent or efficient to recontract for our energy at current prices. As a business plan assumption, we have therefore applied the portfolio weighted average delivered forward price curve in Figure 2 to a projection of p.a. consumption of just under 50,000 MWh for each year of AMP8 as an estimate of our energy costs – see Table 1.

Table 1: Forecast energy costs (£m, 2022/23 price base)[3]

Area	2025/26	2026/27	2027/28	2028/29	2029/30	AMP8 total
Volume	48,400	47,800	47,200	46,700	46,200	n/a
Delivered energy price	203.3	195.3	178.9	171.6	199.9	n/a
Projected costs	**9.8**	**9.3**	**8.4**	**8.0**	**9.2**	**44.7**

Source: Cornwall Insight & SES Water analysis
Note: There is a discrepancy of ~3GWh per annum between our opex forecast and the consumption forecasts presented in the data tables, due to the finalisation of our forecasts at different stages. The figures presented in this table are consistent with the opex forecast.

12. There are a number of uncertainties around the forecast in Table 1, notably consumption for the AMP8 period and whether the delivered price that we contract at will align with Cornwall Insight's projections. There is a risk, for example, that the extent of the fall in the wholesale price that is reflected in the projections (see 2022-23 vs. 2023-24) may not occur and/or there is an upwards price correction during the course of AMP8. For this

[2] The delivered price includes third party charges (e.g. network charges), as well as the wholesale cost of energy. The portfolio weighted average is the weighted average delivered price in Cornwall Energy's price projects across the different regions and meter points that comprise our meter supply point base.

[3] While we have generally reported our forecast expenditure in 2022/23 real prices, we have reported energy costs in 2023/24 prices to align with the price base on which we understand Cornwall Energy have reported their price projections which are used within the forecast.

reason, we consider Ofwat should consider an alternative regulatory treatment for energy costs at PR24 than a fixed ex ante allowance to protect consumers and companies.

E. Our views on regulatory treatment of energy costs

13. As we discuss above and in Chapter 7 – Explaining our costs, the future outlook for power and energy prices is very uncertain.

14. We therefore believe that Ofwat should consider introducing a form of ex-post adjustment ‘uncertainty mechanism’ that will help align PR24 price control allowances with outturn rather than forecast energy price trends. This will provide protection to both consumers and companies during a very volatile period for the energy market and will help to mitigate the risk of unintended consequences. Alongside this, we will continue to maintain an effective operational strategy for the procurement of our power.

15. It is inevitable that actual prices different companies are exposed to will differ from company to company, given the differences in our respective hedging strategies. We, therefore, think a simple approach for capturing energy price effects in the TOTEX allowances, that is linked to observed market prices and a simple, well-structured, uncertainty mechanism, is a justified approach for Ofwat to take at PR24. We set out our justification for this in Appendix SES005B (Cost Efficiency Benchmarking).

16. We expect the design of a true-up mechanism will need to consider, amongst other issues:

    (i) What is the assumption of the level of the delivered energy price in the base year modelled cost from Ofwat’s models and the sensitivity (elasticity) of modelled costs to future changes in energy prices?

    (ii) Given (i), can Ofwat’s TOTEX allowances be considered to move 1-for-1 with movements in an external price index of energy costs?

    (iii) Depending on (i) – (ii) above, does the mechanism need to assume that the elasticity to external prices is not 1-for-1 and if so, what would be the appropriate assumption to make?

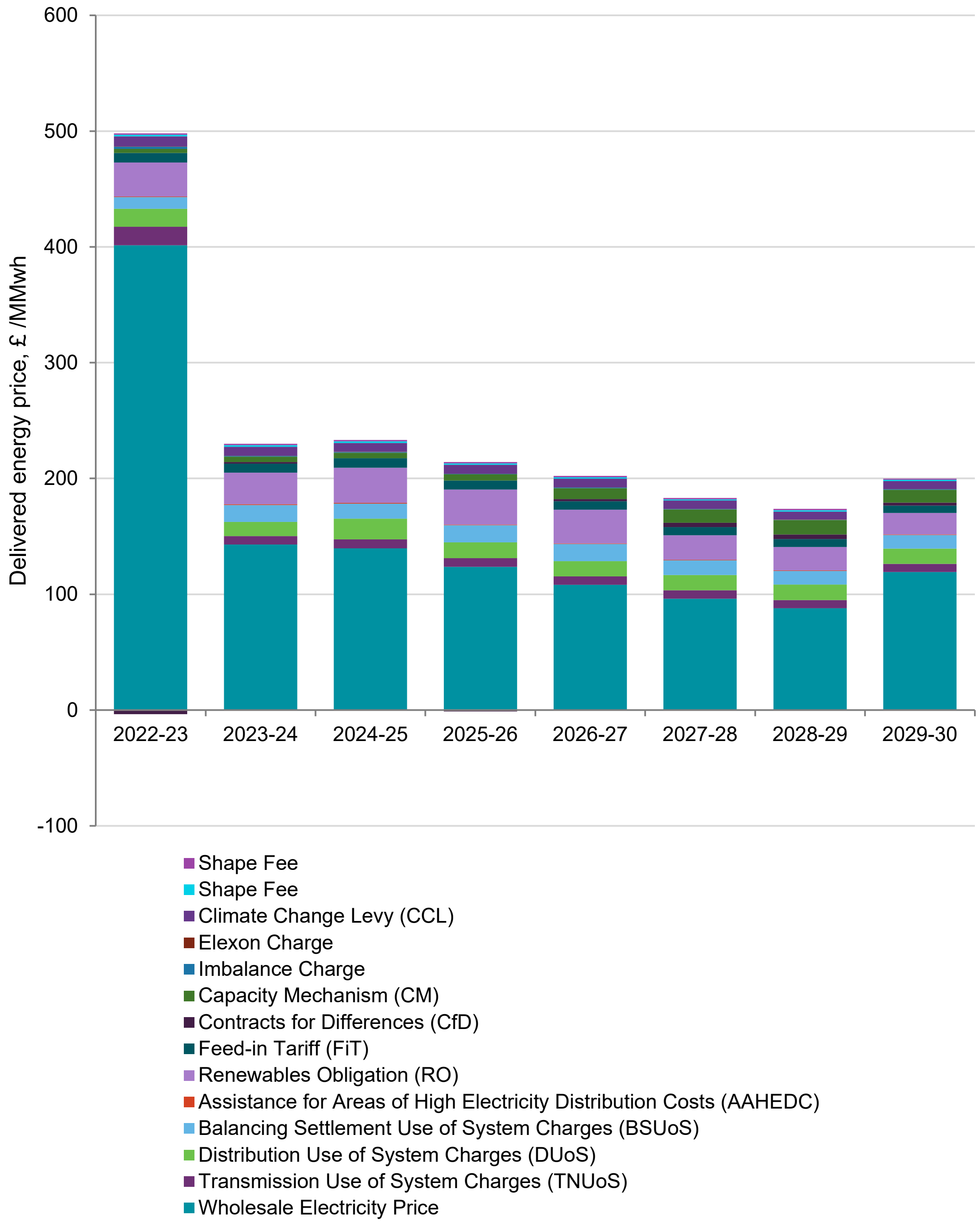
    (iv) What external price index would be appropriate for the purposes of setting the uncertainty mechanism?

    (v) When should the true-up mechanism apply – e.g. within the AMP or at the end of the AMP?

17. The approach that we have taken to capture the impact of future changes in energy prices in our efficient cost modelling is set out in Appendix SES005B. This highlights the complex dynamics that Ofwat need to consider in how it treats energy costs in its base cost modelling and why the questions listed above would be important in designing any form of true-up/uncertainty mechanism for energy price effects.

Annex A – Delivered energy prices

Figure 3: Delivered £/MWh price, portfolio weighted average[4], 2023/24 prices



Source: Cornwall Insight & SES Water analysis

[4] The delivered price includes third party charges (e.g. network charges), as well as the wholesale cost of energy. The portfolio weighted average is the weighted average delivered price in Cornwall Energy's price projects across the different regions and meter points that comprise our meter supply point base.

D. Treatment of Energy Costs in Base Model

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Ofwat
Centre City Tower
7 Hill Street
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Dear Ofwat

Treatment of energy costs in base cost model

We attach a copy of the above confidential report dated May 2023 (the "Report") prepared by KPMG LLP ("KPMG") for us. The Report was prepared for Thames Water Limited, Yorkshire Water Limited, Bristol Water Plc, Affinity Water, South East Water Limited, Sutton and East Surrey Water Plc and Southern Water Limited.

KPMG has agreed that we may disclose the attached Report to you, on the basis set out in this letter, to enable you to verify that a report has been commissioned by us and issued by KPMG in connection with the PR24 Price Control review, and to facilitate the discharge by you of your regulatory functions in respect of Sutton and East Surrey Water PLC subject to the remaining paragraphs of this letter, to which your attention is drawn.

KPMG's work was designed to meet our agreed requirements and the engagement activities were determined by our needs at the time. The Report should not be regarded as suitable to be used or relied on by any party other than us for any purpose or in any context.

In consenting to the disclosure of the Report to you KPMG does not assume any responsibility to you in respect of its work for us or the Report. To the fullest extent permitted by law, KPMG accepts no liability in respect of any such matters to you. If you rely on the Report, you do so at your own risk.

Yours faithfully

Paul Kerr
Chief Financial Officer

Treatment of energy costs in base models

Affinity Water, Yorkshire Water, South East Water, Sutton & East Surrey Water, Thames Water, Bristol Water and Southern Water

Strictly private and confidential

May 2023

Important notice

This Report has been prepared by KPMG LLP ("we" or "KPMG") for Thames Water Limited, Yorkshire Water Limited, Bristol Water Plc, Affinity Water, South East Water Limited, Sutton and East Surrey Water Plc and Southern Water Limited, (collectively "you" or "the Companies", and individual "Company" where the context applies) in accordance with terms of engagement agreed by companies with KPMG under a private contract. This report should not be regarded as suitable to be used or relied on by any other person for any purpose.

The companies have commissioned KPMG to write a KPMG branded report on treatment of energy costs in base models to assist in their considerations regarding the PR24 price review.

In this instance, we consent the companies disclosing the report to the Water Services Regulation Authority ("Ofwat") in the context of the next price control ("PR24") subject ot the entering into of a suitable transmittal letter. .KPMG has not assisted the companies in preparation of any aspect of their PR24 business plans which remain, at all times, the sole responsibility of the companies. KPMG has not made any decisions for the companies and has not assumed any responsibility in respect of any aspect of the Business Plan including what the companies decide, or have decided to, include in their business plans.

Should anyone (other than the companies) choose to rely on this report, they do so at their own risk. Without prejudice to KPMG's liability to the companies subject to and in accordance with the terms of engagement agreed between them, KPMG will accordingly accept no responsibility or liability in respect of this report to any person. This report does not give rise to a client relationship between KPMG and any person (other than the companies). The information in the Report is based upon publicly available information and reflects prevailing conditions as of this date, all of which are accordingly subject to change.

Without prejudice to any rights that the companies may have, subject to and in accordance with the terms of engagement agreed between the companies and KPMG, no person is permitted to copy, reproduce or disclose the whole or any part of this report unless required to do so by law or by a competent regulatory authority.

KPMG does not provide any assurance as to the appropriateness or accuracy of sources of information relied upon, has not sought to establish the reliability of the sources by reference to other evidence, and KPMG does not accept any responsibility for the underlying data used in this report. For this Report the companies have not engaged KPMG to perform an assurance engagement conducted in accordance with any generally accepted assurance standards and consequently no assurance opinion is expressed.

Although we endeavour to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future.

The opinions and conclusions expressed in this report are (subject to the foregoing) those of KPMG and do not necessarily align with those of the companies.

Contents

Executive summary

On 5th of April Ofwat published its *PR24 Econometric Base Cost Models Consultation* which includes the proposed set of econometric models that Ofwat intends to use to set efficient base expenditure allowances at PR24.

PR24 base cost models build on the PR19 modelling approach and include a number of proposed changes. Ofwat is seeking views on the proposed models in response to its consultation by 12th of May.

KPMG was commissioned by a consortium of seven companies (Affinity Water, Yorkshire Water, South East Water, Sutton & East Surrey Water, Thames Water, Bristol Water and Southern Water) to provide an initial assessment as to whether recent developments in the energy markets will be adequately captured by Ofwat's PR24 base econometric models.

Energy costs represent a material component of water and sewage companies' total expenditure, equivalent to approximately 11% of base costs. Ofwat assesses the efficiency of power costs as part of its base econometric models, which use costs that are adjusted for general inflation through CPIH for modelling. Cost allowances are currently set in real terms and indexed by CPIH.

Energy prices have grown significantly faster than CPIH in recent years (35% above CPIH in Q2 2022). When energy prices increase above CPIH, the following issues can arise:

1. Cost models may fail to carry out appropriately an historical efficiency assessment.
2. Base models may not provide for efficient energy costs.

Ofwat's proposed set of PR24 cost models may not appropriately capture energy price inflation. To mitigate the risk of erroneous base cost assessment, potential remedies could include:

- Inclusion of a cost driver that reflects energy price movements.
- Inclusion of a pre-modelling adjustment for power costs based on a relevant price index.
- Introduction of year dummies to capture time variation effects.
- Exclusion of affected years from the sample.
- Inclusion of forecast costs in the wholesale base cost econometric models.

The appropriate treatment of power costs in base econometric models is crucial to ensure that *ex ante* cost allowances reflect the increased input cost pressures which water companies have faced during AMP7 due to recent developments in energy markets. If companies are not fully compensated for the future requirements, the disallowance of efficient costs will create cash-flow risks for the sector. A key objective for incentive-based regulation regimes is to facilitate robust *ex ante* estimation of allowed revenues and to incentivise efficient costs that maintain investment and service quality. Not allowing efficient power costs could introduce unintended consequences or distortions and means that water companies may seek to reduce investment to compensate for an inability to recover efficient costs. This in turn could have a negative impact on the quality of service provided to customers.

Inclusion of a cost driver that reflects energy price changes and a pre-modelling adjustment using a relevant price index are those measures which could best address potential modelling issues. The estimated impact on modelled costs in 2022-23 is an upward adjustment of c.7-10% in water and of c.7% in wastewater.

Correcting for the modelling issues in an historical benchmarking based approach can provide an appropriate starting point for the allowance, but does not mitigate all risks from future energy price pressures for the water sector. Depending on the approach to correcting for the historic modelling issue chosen, the correction should be complemented by a relevant RPE assessment as prices for energy may evolve differently from general inflation during the next price control period.

1. Introduction

Econometric modelling plays a key role in Ofwat's cost assessment framework. At PR19 Ofwat assessed approximately 70% of companies' totex using econometric models. Econometric modelling will continue to play a key role at PR24.

In December 2022, Ofwat published its Final Methodology for the PR24 price review ("PR24"). The document outlines the key principles of base cost assessment for the next price control. Ofwat has published its proposed set of econometric cost models on 5th of April 2023 as part of its *PR24 Econometric Base Cost Models Consultation* and is seeking views from the sector in response to the consultation. The sector has an opportunity to respond to the consultation by 12th May 2023 and suggest improvements to Ofwat's proposed set of cost models.

For PR24 Ofwat intends to build on the PR19 approach, which was in large part supported by the Competition and Markets Authority ("CMA") and will look to make improvements where appropriate.

Ofwat recognises that econometric models may not explain all variations in efficient base costs between companies and over time. As a result, econometric analysis is complemented with cost adjustment claims. The cost adjustment claim consultation is planned in summer 2023. Water companies are invited to submit base cost adjustment claims based on Ofwat's proposed econometric models by 9th June 2023.

1.1. Objectives of the report

Ofwat uses econometric cost models as a primary tool to determine efficient base cost allowances. The PR19 models were estimated based on companies' actual expenditure over the period 2011-12 to 2018-19 (eight years of data). The historical time series available for PR24 would increase to 13 years of data (2011-12 to 2023-24).

A longer dataset is beneficial as it can improve the precision of model estimates. At the same time, the sample period should be carefully considered to ensure there are no structural breaks, and that it sufficiently resembles the forecast period for which it sets cost allowances. A structural break may occur due to a step change in activities which is not accounted for by an exogenous cost driver within the model.

For the next price review, the water sector in England and Wales faces a series of cost challenges. Increasing energy prices represent a key concern for water companies as a result of the substantive cost pressure it has placed on them. Ofwat has published a proposed set of base cost models as part of its PR24 base cost model consultation. Although Ofwat's proposed models include multiple important changes from PR19 cost models, they do not appear to account for the step change in input prices.

KPMG was commissioned by a consortium of seven companies (Affinity Water, Yorkshire Water, South East Water, Sutton & East Surrey Water, Thames Water, Bristol Water and Southern Water) to provide an initial assessment of the impact increased energy prices have on the cost assessment framework for PR24 and in particular whether the recent increases in power costs will be adequately captured by Ofwat's base econometric models.

The report considers the appropriateness of the cost assessment framework in three steps:

- Firstly, it identifies issues that may arise if energy costs are not appropriately accounted for in base models.
- Secondly, it assesses whether the historical cost data for water, sewerage and bio-resources reflect the higher energy costs observed in recent years,
- Thirdly, it considers what type of modelling adjustment would be appropriate to ensure the sector is funded for potential high energy requirements in the future.

The scope of this report does not include any company-specific analysis. The analysis and commentary set out in this report is reflective of the entire sector for the PR24 price control period.

1.2. Structure of the report

The report is structured as follows:

- **Section 2** sets out the context and potential modelling issues which may arise if historical benchmarking data does not appropriately account for increased energy costs.
- **Section 3** assesses the extent to which the historical cost information that Ofwat uses to estimate its base models captures recent energy costs. The section also considers how the base models can robustly account for the increase in energy prices, including assessment of potential modelling amendments.
- **Section 4** discusses the results and sets out key implications for PR24. The section also discusses limitations of the analysis and sets out additional approaches that can be further considered.

2. Context

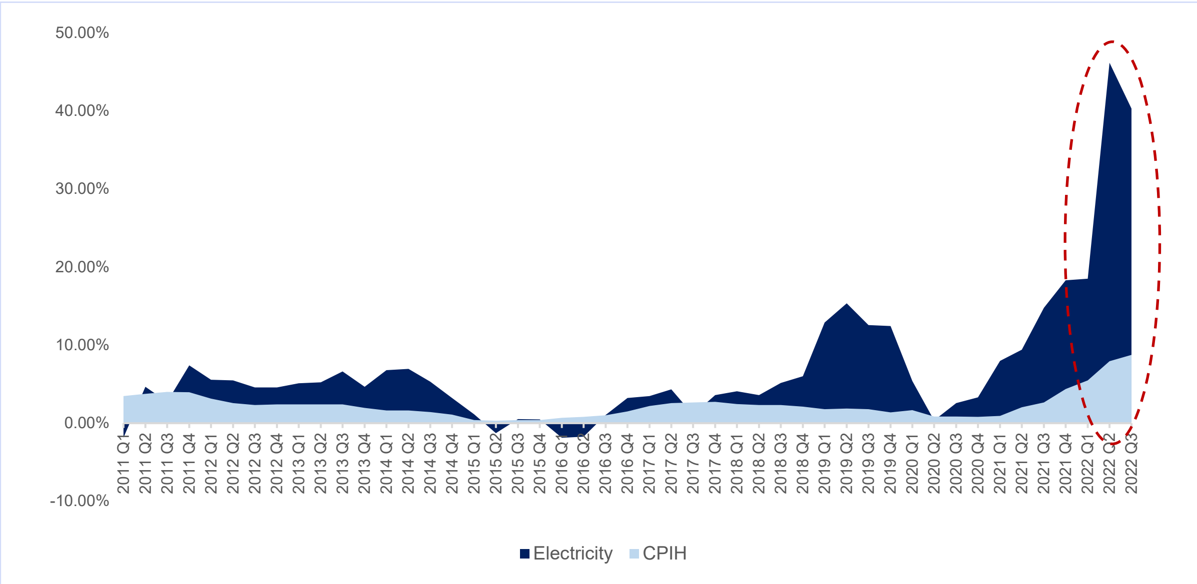
2.1. Recent trends in energy prices

The economic uncertainty in recent years driven by the impacts of the Covid-19 pandemic, climate change, the conflict in Ukraine and Brexit, has led to increased macroeconomic volatility. Overall consumer price inflation (CPIH) in the UK reached a record high in 2022, peaking at nearly 10% (9.6% in Oct-22) - the first time since Dec-90, according to the Office for National Statistics.

A significant driver of high inflation has been an unprecedented increase in global energy prices. Companies' revenues and RCV are to some extent protected against these energy cost increases through general CPIH indexation applied by Ofwat. The energy component of CPIH is 4.5% of the total (as of Dec-22), of which electricity, gas and other fuels make up 2.9%, with the rest largely relating to petrol.

However, energy prices have increased significantly faster than general inflation. Russia's invasion of Ukraine led to large increases in the price of gas, which has directly affected the price of electricity (as the cost of gas tends to set the market price of electricity in UK), pushing up retail electricity bills as well as retail gas bills. Electricity prices increased by 35% above CPIH in Q2 2022, the highest increase in real terms across the whole sample period that Ofwat considers for its base cost models (Figure 1).

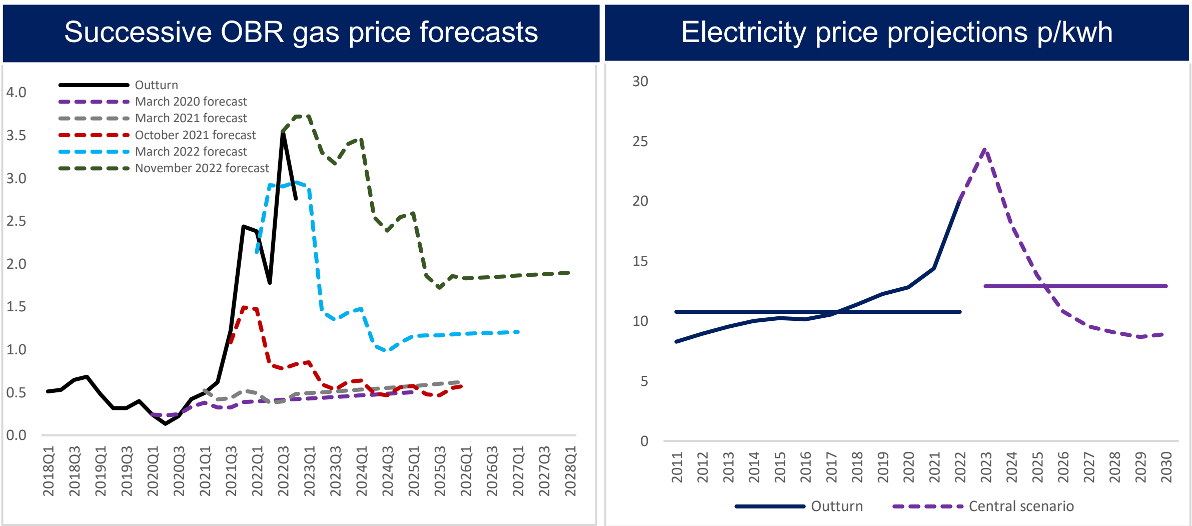
Figure 1: Year-on-year increase in the electricity price index and CPIH



Source: BEIS and ONS data, KPMG analysis

The political and economic landscape in the UK and globally is likely to have a continued impact on the energy market and sustain prices at record highs. These political and economic events have also created unusually high and sustained volatility and uncertainty in future gas prices (Figure 2). Although there is a general expectation that energy prices will start to gradually decrease from the second half of 2023, energy prices may continue to remain high compared to historical levels. There is also a risk that energy prices could rise further and will remain volatile. The uncertainties regarding gas supply in Europe over the coming years undermine the reliability of future price estimates. A relatively mild European winter in 2022 with downward pressure on electricity consumption, could be a potential source of "optimism bias" in forecasts.

Figure 2: Future trends in energy prices



Source: OBR, BEIS, electricity price projection by Cornwall Insight on behalf of Water companies, KPMG analysis

2.2. Treatment of power costs in base econometric models - key issues

Water companies use energy to abstract, transport and treat water and wastewater.

Energy costs represent a material component of water and sewage companies' total expenditure, approximately 11%[1] of base costs according to Ofwat's PR24 base cost dataset. Ofwat assesses the efficiency of power costs as part of its base econometric models, which use costs that are adjusted for inflation through CPIH for modelling. Additionally, cost allowances are set in real terms and indexed to CPIH.

While CPIH captures some movements in energy prices, the extent to which these movements are reflected in overall inflation is limited. Energy costs comprise of only 2.9% (excluding petrol) in the CPIH. As a result, changes in CPIH are unlikely to sufficiently reflect the energy price exposures that water companies face.

<u>When energy prices *increase above CPIH*, three main issues may arise in terms of their capture in the models:</u>

1. **Deflating nominal energy costs by CPIH may not remove the effect of inflation entirely**. If all inflationary pressures are not excluded from the sample, values will not be comparable across years. Energy prices have grown above general inflation in recent periods. In consequence, CPIH-deflated costs may continue to carry part of the inflation and costs will appear 'higher'. Consequently, the sector may look 'artificially' less efficient in recent periods compared to the past.

2. **Not capturing the energy input inflation appropriately may have a disproportionate impact on energy intensive water companies.** As a result, companies that are more energy intensive (i.e., have a larger share of energy costs in

[1] 2012-2022 average

their base costs) may appear less efficient relative to those who are less energy intensive.

3. **A model based on historical data, including periods when energy costs were significantly lower than current/future costs, may result in cost allowances for the future that are too low.** Ofwat's base cost models, based on historical information, will likely generate allowances for the future that are insufficient to meet the efficient energy costs actually incurred by companies.

These three issues can have the following modelling implications:

1. **Cost models may fail to appropriately conduct historical efficiency assessment.** The first two issues (set out above) could undermine the robustness of econometric models, due to a misshape in the model performance. As a result, this can lead to biased coefficients which may distort Ofwat's comparative efficiency assessment and estimation of a robust historical catch-up benchmark.
2. **Lack of provision of efficient energy costs through base model.** The third issue (set out above) is critical for the setting of efficient allowances for the next price control. Ofwat's econometric models are based on historical cost data. If there is a discontinuity triggering a step change in power costs which is not appropriately accounted for, modelled allowances will fail to adequately reflect the future power requirements for the sector. Contrary to this, even if energy prices start to fall, there is no mechanism that ensures provision of efficient energy costs (in both directions) via Ofwat's models.

Ofwat's historical base cost dataset[2], includes 11 years of data until 2021-22. The recent spike in energy prices is only captured by the last two years of the data, 2020-21 and 2021-22. More than 80% of the sample period reflects a lower energy price scenario. This means that if Ofwat set cost allowances for the future, based on data from 2011-12 to 2021-22, significantly more weight would be placed on a period of low energy cost than the recent period of high energy cost, and consequently a lower allowance than would be appropriate given current energy costs.

[2] Dataset (v3) published in November 2022.

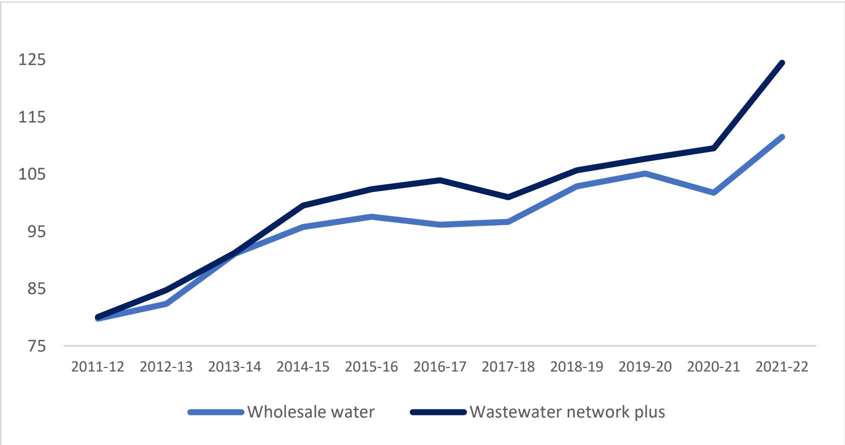
3. Treatment of energy costs in base models – analysis

3.1. Increased energy costs for water companies

Power costs have increased notably in recent years for water and sewage companies in the UK. In 2021-22, the sector incurred energy costs of £447m in wholesale water (in 2017-18 prices), which is a 27% increase from the 10-year historical average[3]. In 2021-22, sewage companies have spent in total 28% more (£387m in 2017-18 prices) on energy compared to the 10-year average (£303m, 2017-18 prices). Overall, in 2021-22 the water sector has witnessed highest year to year rate (c.12%) in power costs in the last 10 years. This high energy inflation was not anticipated at PR19; it is not included in cost allowances nor is there an RPE indexation mechanism to recover it.

Power costs in real terms may increase because of an inefficient use of energy, and therefore an increase in energy consumption. However, figure 3 shows that the unit price of energy per MWh has also increased over time with a significant upward growth in the recent period. In 2021-22, industry average power cost per MWh energy consumed in water has increased by 17% and in wastewater network plus by 26% from 10-year historical average (2011-12 to 2020-21). This suggests that power cost increases for water companies can be largely explained by the upward movement in the energy prices.

Figure 3: Power costs (£) per MWh energy consumed, 2017-18 prices



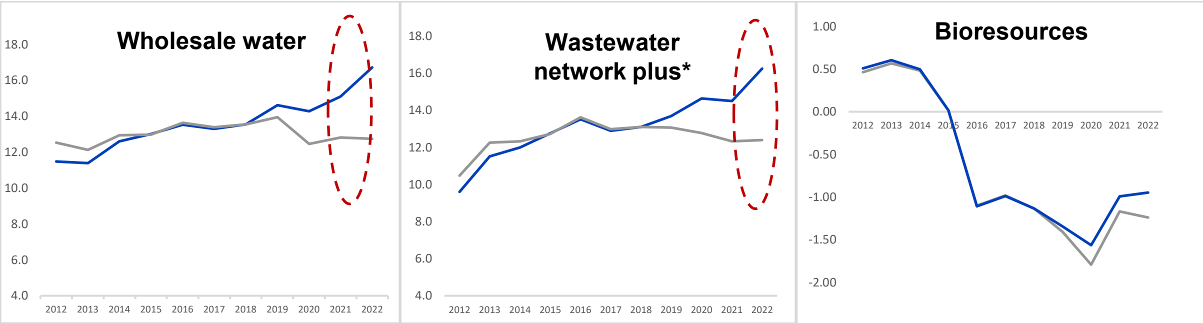
Note: *Network plus comprises of sewage treatment and sewage collection controls

Source: PR24 Ofwat's PR24 base dataset (V3, November), KPMG analysis

Power costs can also grow because of overall activity growth in the water sector. However, unit costs per connected property in CPIH terms for wholesale water and wastewater network plus have also significantly increased in the recent periods. Figure 4 compares power costs per connected property when deflated by the CPIH and when deflated by the BEIS index for electricity prices. When the same unit costs are deflated by BEIS electricity index (instead of CPIH), the trend for unit costs stabilises across the modelling period. Deflating nominal power costs using electricity price index could potentially correct for modelling issues 1 and 2 (see section 2.2).

[3] average over 2011-21 period is £351m, in 2017-18 prices

Figure 4: Power costs (£) per connected property



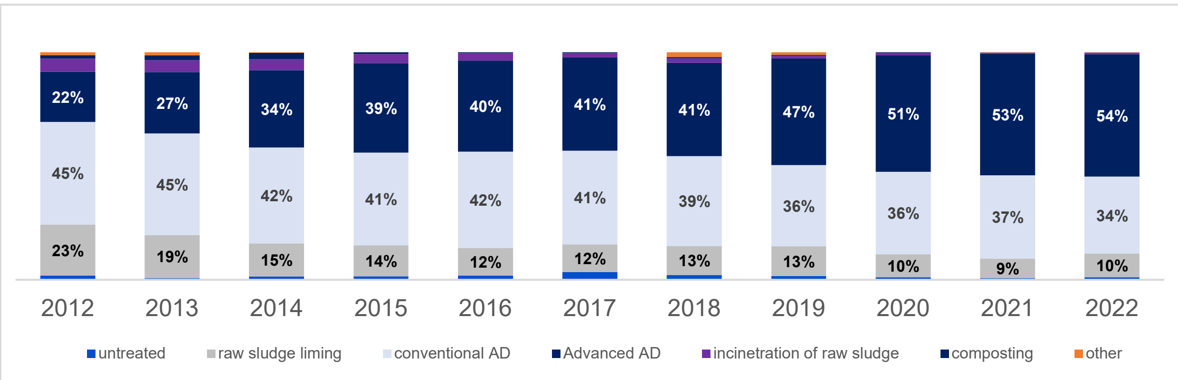
Note: **Blue line denotes unit costs adjusted for CPIH**, grey line denotes unit costs adjusted by BEIS electricity price index

Source: Ofwat's PR24 base dataset (V3, November) and BEIS electricity index data, KPMG analysis

In bioresources activities, power costs per connected property decrease over time. As part of the sludge treatment process, companies generate energy and income is deducted from these costs[4]. Negative unit cost values indicate that the sector, in aggregate, generates more energy than it uses internally. A decreasing trend for power costs per connected property in the bioresources control is reflective of the water sector switching to treat a higher proportion of sludge. This has been enabled due to more cost-efficient treatment technologies which generate more energy from the treatment process (Figure 5).

Technologies adopted by sewage companies vary significantly (Figure A1, annex A). Energy generation is particularly high for companies which use advanced anaerobic digestion (AD) technologies to treat sludge. A few firms can take some steps to improve energy generation over time, but the level of improvement that the sector can achieve over the next price control period is limited. As energy generation is only applicable to the bioresources control, significant energy cost revisions due to expected changes in energy generation for other activities (e.g., wholesale water and wastewater network plus) are not expected. For the sector as a whole the impact of recent increases in energy prices will have a more prominent impact on wholesale water and network plus wastewater activities, thus analysis in the rest of the report will primarily focus on those areas.[5]

Figure 5: Proportion of sludge treated by different technologies, sector average



Source: Ofwat's PR24 base cost dataset, v3, KPMG analysis

[4] Netting of energy income/savings from treatment opex is in accordance with Ofwat's Regulatory Accounting Guidance (RAGs). See RAGs, RAG-4.10-—Guideline-for-the-table-definitions-in-the-annual-performance-report, page 137.
[5] There may be individual companies where energy costs for bioresources are a concern.

Ofwat's econometric models are based on historical information. When new outturn data becomes available through Annual Performance Reports (APRs), Ofwat is expected to include it in the base econometric models. PR24 cost assessment models will be based on more years of data than is currently available. At a minimum, econometric models will include one more year of data, e.g., 2022-23 year.

The inclusion of 2022-23 may further distort the efficiency assessment as energy prices are expected to increase further in 2022-23. Additionally, the impact of the peak rise in prices in 2022 may take time to fully materialise in the water sector due to companies' hedging strategies. As current forward contracts expire, the new contract would incorporate future levels of expected inflation and uncertainty.

3.2. Modelling considerations to account for an increase in energy prices

To mitigate the risk of erroneous base cost assessment due to the identified step change in power cost data, potential remedies include:

– Inclusion of a cost driver that reflects energy price movements.
– Inclusion of a pre-modelling adjustment for power costs based on a relevant price index.
– Introducing year dummies to capture time variation effects.
– Exclusion of affected years from the sample.
– Inclusion of forecast costs in the wholesale base cost econometric models.

We discuss each potential approach in detail.

Inclusion of a cost driver that reflects energy price movements

To capture movements in energy prices we have tested the inclusion of BEIS electricity price index as an additional cost driver in Ofwat's base econometric models.

In its PR24 Final Methodology, Ofwat stated that the PR19 wholesale base cost drivers and corresponding explanatory variables provide a good starting point for PR24, but that it is also open to considerng additional or alternative cost drivers that can improve econoemtric models.

To introduce a new explanatory factor in base models, it has previously been suggested that the following conditions should be met[6]:

- Suggested cost driver should align with Ofwat's cost assessment principles (e.g. clear engineering, operational and economic rationale and outside the control of the company in the short term);
- Suggested cost driver should improve the performance of wholesale base econometric cost models;
- Robust historical data is available or can be collected for all water companies back to 2011-12 on a consistent basis (between companies and over time).

Input prices directly affect costs and changes in them are key drivers of companies' expenditure. Ofwat has used input prices as cost drivers previously in water and sewage cost assessment models. At PR14, regional BCIC index and average regional wage index based on ONS ASHE SOC surveys were included in the model to capture regional price differences.

[6] Assessing base costs at PR24, Ofwat, 2021 December

At PR14, CEPA (on behalf of Ofwat) defined input prices as "*one of the most important cost drivers*[7]."

BEIS' electricity price index can potentially reflect movements in energy prices over time. A key benefit of using an external price index is that it meets Ofwat's cost driver selection criteria, specifically that it is outside of direct management control.

Estimation results for water models show that the coefficient for the electricity price index has, as expected, a positive sign in all models. The driver is statistically significant in the treated water distribution model and in the wholesale water models[8]. The electricity price index has an expected positive sign in all sewage treatment, sewage collection and network plus (wastewater) models and is statistically significant in some of collection and treatment models (Annex B1).

Modelling results suggest that performance of the models for water and wastewater (sewage collection and sewage treatment models) remain robust. Other coefficients have the same signs and significance levels as PR19 models, with negligible movements in magnitudes. The models' predictive power and the range of efficiency scores remain broadly the same across all water and sewage models (Annex C).

When comparing efficiency ranking of the companies based on the last five year with and without inclusion of additional cost driver, we find that comparative efficiency positions for multiple companies have changed (Annex C).

After including the BEIS electricity price index as an additional cost driver in water models, we find that the sector's overall modelled costs for wholesale water, over the last five years, have increased by 1.4% and for wastewater network plus by 0.9%[9]. Meanwhile, the impact based on the last year is higher, modelled costs for the last year have increased by 5% for water and 3.4% for wastewater network plus. When estimating an impact on modelled costs for 2022-23 year[10], we find that modelled costs have increased by 10.4% in water and by 7.2% in wastewater.

For the purpose of generating an expected allowance for energy costs, there is an important role which future energy price forecasts can play to setting efficient costs, provided the determination is supported by a true-up mechanism to protect against future uncertainties.

Pre-modelling adjustment for power costs based on a relevant price index

Establishing a valid starting point for econometric models where costs are comparable and consistent across companies and years is the key for robust benchmarking. To ensure that Ofwat's econometric assessment is carried out on a comparable basis and the estimated efficient allowances are appropriate, power costs can be adjusted prior to the modelling, using energy price indices.

Pre-modelling adjustment of power costs based on the difference between CPIH and the energy price index (BEIS) can potentially solve for the series of modelling issues identified in *section 2.2.* We make the correction for the wedge between energy prices and CPIH for power costs after inflation adjustment and before modelling, and refer to it as a 'wedge adjustment factor' (Figure 6). The 'wedge adjustment factor' accounts for an additional inflationary

[7] Cost assessment – advanced econometric models, CEPA (developed for Ofwat), 2014

[8] with p-values of 0.16 and 0.13, respectively

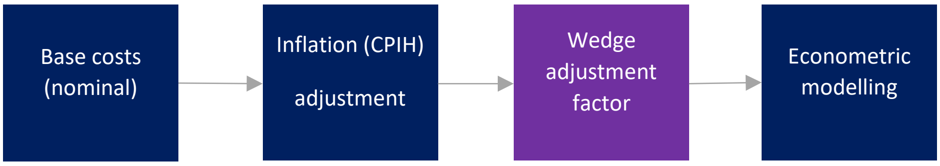
[9] We note that the figure is based on the triangualted model results of the last five years of the histroical period (2017-18 to 2021-22) and does not reflect the impact from efficiency challenges.

[10] Using PR19 business plan forecast drivers and outturn electricity price index and CPIH index for 2022-23 Q2 and Q3.

pressure on energy costs which is embedded in nominal values on top of general inflation and which should be removed before modelling to enable a comparision of costs, as if prices of energy had not changed on average.

The ‘wedge adjustment factor’ is an annual correction and is applied to all companies. However, the value of the pre-modelling adjustment differs across the sector, due to the variation in the reported proportion of power costs in the base expenditure by companies[11].

Figure 6: Pre-modelling adjustment



Source: KPMG analysis

Pre-modelling adjustment is a well-established tool in cost assessment approaches in regulated sectors. The general CPIH Inflation adjustment applied by Ofwat is a pre-modelling adjustment which is already used by Ofwat to correct for the variation in costs across years, due to economy-wide inflationary factors. Ofgem applies pre-modelling adjustments to network companies’ costs to reflect factors not incorporated within econeomtric model cost functions. The main adjustment applied by Ofgem at RIIO2 price controls is to account for the regional wage differences based on relevant labour indices[12].

We use Ofwat’s PR24 base cost datasets for wholesale water and wastewater to apply a pre-modelling adjustment. With a pre-modelling adgustment, the sector’s reported total power costs in real terms (2017-18 prices) are lower than the values used in Ofwat’s econometric models. This implies that Ofwat’s current benchmarking results would have overstated the inefficiency of the sector, reflecting modelling issue 1 (see section 2.2).

We have estimated Ofwat’s base econometric models after making the pre-modelling adjustment. Modelling results suggest that performance of the models for water and wastewater (sewage collection and sewage treatment models) remain robust. Coefficients have same the signs and significance levels as the PR19 models, with slight movements in magnitudes (Annex B2). The models’ predictive power and the range of efficiency scores remain broadly the same across all water and sewage models.

When comparing the efficiency rankings of the companies based on the last five year with and without pre-modelling adjustment, we find that comparative efficiency positions for multiple companies have changed (Annex C). The impact is not very significant. Shifts in efficiency rankings are more pronounced in sewage models. Changes in efficiency positions across companies can be explained by pre-modelling adjustments to have corrected for the modelling issue 2 (see section 2.2).

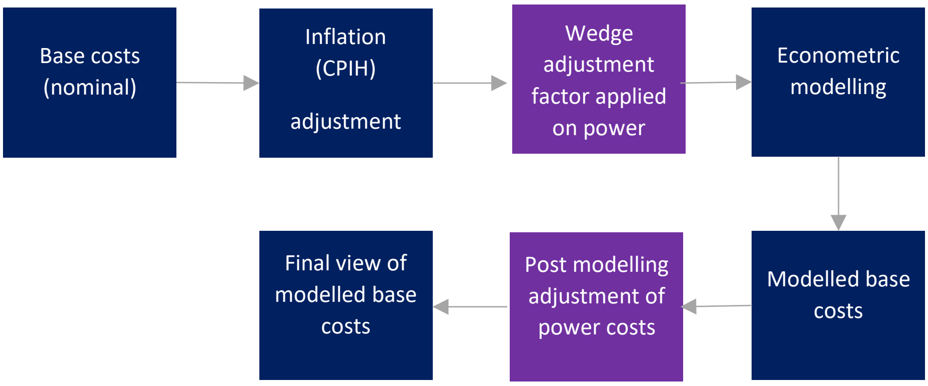
The key challenge with the pre-modelling adjustment is the robust implementation of the approach as it requires a post-modelling uplift of modelled power costs back to CPIH terms (Figure 7). If the pre-modelling approach is applied at PR24, then modelled allowances for

[11] Applying an adjustment on company’s own power share of costs instead of to a power share of notional company more accurately controls for the actual price pressures that companies face. However, applying an adjustment on notional share of power costs may better reflect efficiency incentives.

[12] RIIO-ED2 Final Determinations Core Methodology Document, [RIIO-ED2 Final Determinations Core Methodology.pdf]

power costs should be first adjusted back by the 'wedge adjustment factor' to incorporate input price pressures which were removed before modelling.

Figure 7: Pre-modelling adjustment with a post modelling uplift of power costs



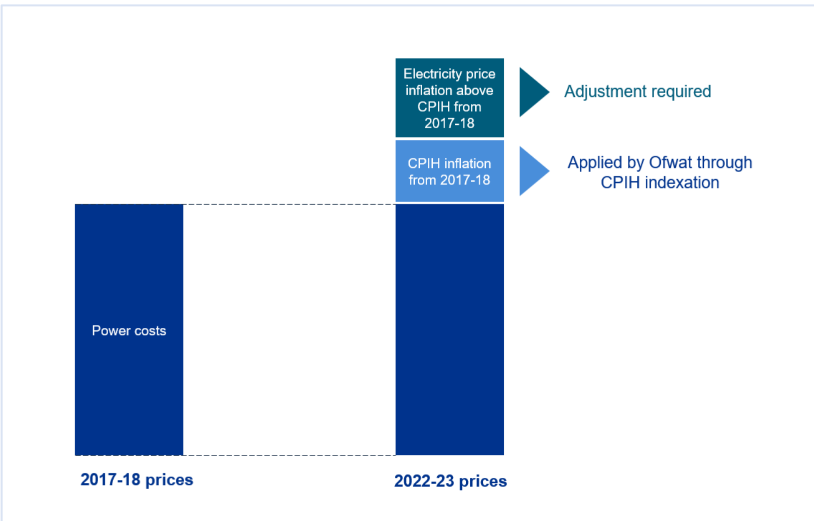
Source: KPMG analysis

Ofwat's final cost allowances are set for total base costs. Estimated modelled costs from econometric benchmarking do not distinguish between different cost areas. To adjust the power cost component of modelled allowances with the 'wedge adjustment factor', it should first be estimated how much of the power cost in the sample period has been directed back to the modelled allowance. In theory, this can be achieved through two approaches:

1. The company proportion approach, where the value of the modelled power costs for a company is the proportion of its power costs out of the company's dependent variable, multiplied by the modelled costs of a company.

2.The sector proportion approach, where the value of the modelled power costs for a company is the proportion of the sector's power cost out of the sector's dependent variable, multiplied by the modelled costs of a company.

Figure 8: Post modelling uplift of power costs using the 'wedge adjustment factor'



Source: KPMG analysis

To derive modelled costs, the post-modelling adjustment should be applied based on the 'wedge adjustment factor' between the price base in which econometric modelling is employed and the year for which modelled costs are estimated. At PR19, base costs were modelled in 2017-18 prices and then indexed to CPIH inflation to provide allowances in nominal values. Modelled allowances for 2022-23 are indexed to the CPIH inflation, thus 2017-18 values are uplifted by observed inflation between 2017-18 and 2022-23. To reflect energy price movements above headline inflation, power costs should be first converted using 'wedge adjustment factor' between 2017-18 and 2022-23 year and then indexed to CPIH (Figure 8).

After applying the post-modelling adjustment through the company proportion approach, we find that sector's overall modelled costs over the last five years of histroical period for the wholsesale water and network plus wastewater have increased by 0.7% and 1.0%, respectively[13]. The sector's modelled costs in 2021-22 (the last year in the sample) have increased by 3.1% in water and by 4.3% in wastewater. The estimated impact in 2022-23 year is more pronounced due to electricity prices being significantly higher than CPIH inflation in 2022-23. These result in a 6.9% increase in modelled power costs in water and a 6.5% increase in wastewater for 2022-23.

When modelled costs are estimated over an historical period (e.g. over last 5 years, or for the last year in the sample), the post-modelling adjustment can be applied using outturn electricity index (e.g. inflating power costs by 'the wedge adjsutment factor"). When modelled costs are estimated over the next period where outturn indices are not yet published, the post modelling adjustment can be applied based on the forecast wedge between general inflation and energy prices and then trued-up alongside the CPIH reconciliation. The post modelling adjustment can potentially correct for modelling issue 3.

Estimation of modelled power costs adds an additional layer of complexity to the overall cost assessment approach, which should be carefully considered when considering the pre-modelling adjustment of power costs based on a relevant index.

Introducing year dummies to capture time variation effects

Inclusion of year dummies can potentially explain the step change in energy prices that the water sector faced in recent years and/or expects to see at PR24. Year dummies can be used to control for atypical periods in the sample and capture time-related effects that are not already in the model. We have included a 2021-22 year dummy in Ofwat's econometric models as the spike in energy prices is most pronounced in this year.

At the PR19 redetermination, the CMA put a high bar in using a year dummy to capture year-specific effects. The CMA consulted on whether to include 2019/20 data in the base cost models and considered using a year dummy for 2019-2020 to account for the potential atypicality of the year. At the time, it chose not to include a dummy year in its final decision, as the estimated coefficiencts were not stable in terms of significance across models[14].

Estimation results (Annex B3 and annex C) indicate that the 2021-22 year dummy does not have a statistically significant coefficient in any of the water models, but shows the expected positive sign, implying higher costs in 2021-22 year relative to the other periods. In sewage models, the year dummy also has an expected positive sign, and is statistically significant in the treatment models. After including the year dummy for 2021-22 year in water models, we find that modelled costs for the sector have increased by 0.2%. In wastewater network plus,

[13] We note that the figure is based on the triangualted model results of the last five years of the histroical period (2017-18 to 2021-22) and does not reflect the impact from efficiency challenges.

[14] Working paper – 2019/20 data for base cost models, The PR19 CMA,

the sector's total modelled costs have increased by 0.4%[15]. Modelled costs based on the last year have increased in water by 2.0% and in wastewater by 6.3%.

The year dummy in the model can potentially be picking up other cost explanatory factors than just increased energy prices which might be a key obstacle in applying this approach.

Exclusion of affected years from the sample

Exclusion of affected years from the sample can be a pragmatic solution to avoid distortion of the sample due to the high energy prices in recent years, compared to the past. However, reducing a sample size should be carefully considered in line with potential benefits that 2021-22 year exclusion can provide.

We have estimated models without 2021-22 year. The models performance across water and wastewater controls remain broadly stable (Annex B4). When comparing the efficiency rankings of the companies with and without the exclusion of 2021-22 year, we find that comparative efficiency positions for multiple companies have changed (Annex C4). After excluding the 2021-22 year, we find that modelled costs for the sector have decreased by 0.5% in water and by 1.0% in wastewater[16].

Exclusion of an atypical year can only correct for modelling issues 1 and 2 (see section 2.2). If the 2021-22 year were excluded, the models will likely still generate allowances that are insufficient to meet the efficient energy costs faced by companies. To also correct for modelling issue 3, the exclusion of 2021-22 year can be considered with a post-modelling uplift of power costs (see section on pre-modelling adjustment).

If energy prices remain high over the next few years, the number of atypical years in the sample that need to be excluded will increase. This will significantly understate the increased requirements of the sector in the recent period and may not be a plausible solution given the possible implications for the models being estimated.

Inclusion of forecast costs in the wholesale base cost econometric models

Ofwat has previously relied on historical cost information to set future allowances for base costs for the water sector. Due to a step change identified in power costs, the historical period may not be a good reflection of the future and an inclusion of business plan forecasts in the wholesale base cost econometric models at PR24 could be a reasonable option to consider for the next price control period.

Besides potentially capturing the step change in costs, the inclusion of business plan forecasts could also provide other benefits to the cost assessment framework. The use of forecast information will increase the sample size, thus may improve the models' explanatory power and precisions or level of confidence in sample estimates.

There are also risks associated with using forecast information which should be carefully considered. The inclusion of PR24 business plan forecasts may reduce the independence of

[15] We note that the figure is based on the triangulated model results of the last five years of the histroical period (2017-18 to 2021-22) and does not reflect the impact from efficiency challenges.

[16] We note that 0.8% does not reflect the impact from efficiency challenges.

the benchmarking process. Forecast information may reflect differences in risk appetite between companies and therefore distort setting the appropriate benchmark.

In its PR24 Final Methodology, Ofwat has expressed an intention to consider business plan forecasts in its base cost assessment and pointed to precedent in the energy sector. Although it is noted that Ofgem uses the combination of historical and forecast information to estimate cost allowances for network companies, the RIIO regulatory framework is substantially different from the one in the water sector. Risks associated with using business plan data for cost assessment in the water industry could be significantly different and forecast information should be used cautiously in models.

An inclusion of business plan forecasts may partially solve issue 3 (see section 2.2.), but the first two issues (on comparative efficiency) could still undermine the robustness of econometric models and distort the efficiency assessment.

To appropriately capture the change in power costs, Ofwat may also consider estimating models using a reduced/truncated historical sample period focused on the most recent evidence.

3.3. Summary of results

The report has considered a number of modelling amendments to adequately treat power costs at PR24. Figure 9 below summarises findings for each approach and an estimated impact on the sector's overall modelled costs (pre RPE and efficiency challenge) for water and wastewater network plus controls.

Modelling remedies that could potentially correct for all three issues identified in the report are:

- Inclusion of a cost driver that reflects energy price movements in base costs models.
- Inclusion of a pre-modelling adjustment for power costs based on a relevant price index with a post-modelling adjustment of power costs.

Other approaches considered in the report only partially capture power costs movements. Inclusion of a year dummy may capture other factors different from energy price pressures. Excluding atypicial years from the modelling will potentially further understate the power cost requirements actually faced by companies. Inclusion of business plan forecasts in the assessment can partially correct modelling issue 3, but it is unable to solve for issues related to comparative efficiency benchmarking. As a result, the most suitable approaches to capture movements in energy costs in PR24 base costs models are an off-model (pre-modelling) adjsutment (with post-modelling uplift) or an inclusion of relevant cost driver.

Incorporating an energy price factor as a cost driver in the models rather than an off-model adjustment provides number of benefits. Under the pre-modelling adjustment approach, submitted power costs by companies are shifted up or down before benchmarking assessment to improve comparability across companies. This approach requires the pre-modelling adjustment to be reversed after econometric modelling. Including a measure of energy prices as a cost driver in the econometric models could allow models to estimate the extent (the weight) to which total costs are driven by energy price pressures. It will not be necessary to estimate the proportion of costs affected by the price variation. Estimation of modelled allowances is automatic (through estimated coefficients) and does not require a post-modelling adjustment of power costs.

Both approaches have a material influence on modelled costs. The estimated impact (an increase in modelled costs by c.7-10% in water and by c.7% in wastewater) in 2022-23 is notably higher compared to the historical period. This arises as a result of energy prices growing significantly above inflation in 2022-23. Electricity prices increased by 32% (Q2 and Q3 average) in 2022-23, which is highest increase in real terms across the whole sample period that Ofwat uses for its base econometric models.

The impact of the spike in prices in 2022-23 may materialise in the water sector with a lag period as some companies may have taken forward positions or hedged their energy costs in the past[17]. While companies can reduce power costs with effective hedging strategies, this would represent a gain through efficiency improvement which under Ofwat's cost assessment framework should be rewarded. Long-term contract and hedging can constitute sensible management action to improve energy cost efficiency in the short term or to avoid a basic level of cost escalation in the future. However, hedging is a costly and a limited management tool. Companies cannot be expected as a base case to have hedged against energy cost increases experienced in the recent period. Therefore, high energy prices may put significant input cost pressures for water companies over the PR24 price control period. If energy prices are going to remain high over future periods, the impact may become more material.

Figure 9: Summary of results from considered modelling amendments

Approach		Inclusion of electricity price index in models as a cost driver	Pre-modelling adjustment with post modelling uplift of power costs	Introducing a dummy year in the models as a cost driver	Excluding the affected years from the sample (e.g., 2021-22)	Inclusion of business plan forecasts
Impact on modelled costs (last 5 years)	Wholesale water	**1.4%**	**0.7%**	**0.2%**	**-0.5%**	
	Wastewater network plus	**0.9%**	**1.0%**	**0.4%**	**-1.0%**	
Impact on modelled costs (2021-22)	Wholesale water	**5.0%**	**3.1%**	**2.0%**	**-0.5%**	
	Wastewater network plus	**3.4%**	**4.3%**	**6.3%**	**-1.2%**	
Impact on modelled costs (2022-23)	Wholesale water	**10.4%**	**6.9%**			
	Wastewater network plus	**7.2%**	**6.5%**			
Suitability	Wholesale water					
	Wastewater network plus					
Comment		May correct for issues 1, 2 and 3.	May correct for issues 1, 2 and 3 but requires modelled power costs to be estimated	May capture other factors different from movement in energy prices.	May further increase the issue 3	May only partially address issue 3. It does not correct for issues 1 and 2.

Can potentially correct for all modelling issues.
Can potentially correct only some modelling issues.
Cannot correct for any modelling issues.
Source: KPMG analysis

[17] Hedging is a risk contract for the party providing the hedge and is therefore also driven by current energy prices, as well as the future expectation of price movements.

4. Conclusions and implications for PR24

In 2021-22, the water sector has shown an approximately 12% increase in power costs, which is the largest year on year growth rate for the last 10 years. This is reflective of high energy prices as a result of the recent political and macroeconomic developments, both globally and in the UK. Individual water companies' exposure to energy prices may vary, depending on the hedging arrangements. Some companies are fully hedged for the current period but have open positions for the next few years. It is not however expected that companies will be hedged for the entire price control period nor should a hedged position necessarily represent the appropriate starting point or base case for the sector at PR24.

High energy prices may have shifted the water sector's future energy cost requirements significantly higher compared to the historical average. This means that historical trends may no longer be sufficient to determine future energy costs and PR24 cost assessment models should be designed to reflect the step change on energy market.

Ofwat uses CPIH-deflated cost data in its econometric models to conduct an efficiency assessment on a comparable basis. The report has identified three modelling issues that arise when energy prices move differently from general inflation. These could distort Ofwat's historical comparative cost efficiency assessment and result in future efficient costs being disallowed.

The magnitude of the adjustment that may be required to ensure sufficient funding over PR24 period will depend on the number of unknowns, including the PR24 econometric cost model specifications.

To mitigate risks from not accounting for rising power costs at PR24, the report has considered a number of modelling amendments. We have found that controlling for energy price movements in econometric assessment has a material impact on the sector's overall modelled costs in the recent period.

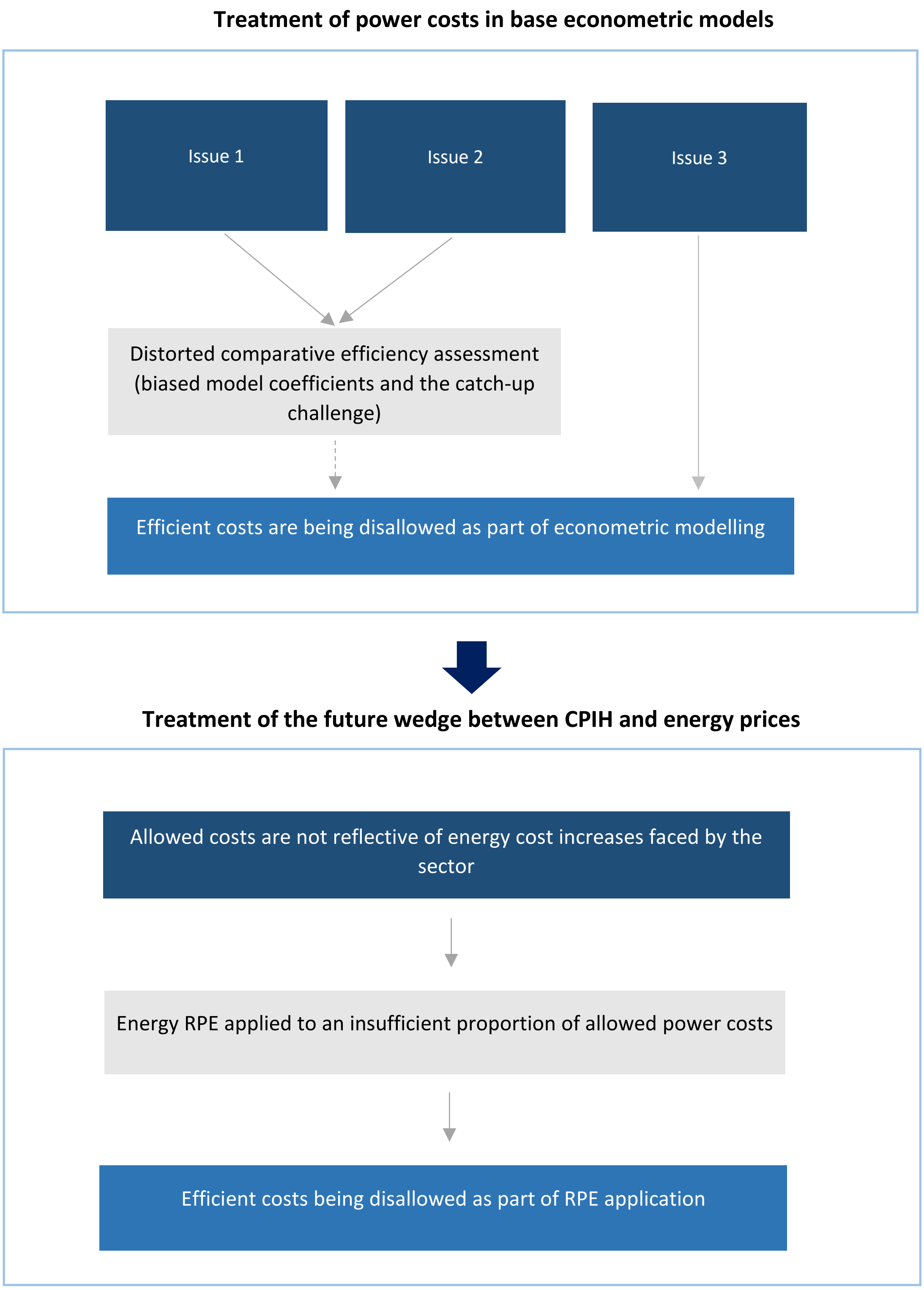
Correcting for the modelling issues in the historical benchmarking is a first and crucial step to account for the risks the sector faces from an increased power cost. It provides an appropriate starting point for the cost allowance, but it does not mitigate all the risks from future energy price pressures for the water sector.

The impact of rising (or changing) energy prices can be fully captured only if the modelling correction is complemented by a relevant RPE assessment as prices for energy may evolve differently from general inflation during the next price control period.

Accounting for power cost increases in econometric models and the application of an RPE are two different but closely interlinked mechanisms. They do not serve as substitutes but are to be applied together (Figure 10). The former should ensure that allowed efficient costs already reflect the higher energy prices which the water sector currently faces. Only then the latter may provide an adequate protection for the future wedge.

This report has focused on the treatment of power costs within PR24 econometric models. However, there may be other cost items which display similar tendencies (e.g. chemicals, materials etc.), that should also be considered to ensure water companies are sufficiently funded for their requirements in the next price control period.

Figure 10: Implications of not accounting for rising power costs at PR24



Source: KPMG analysis

The key aim for incentive based regulatory regimes is to facilitate robust *ex ante* estimation of allowed revenues in order to continue to incentivise efficient costs that maintain investment and service quality. To not provide for efficient costs creates both financeability problems and problems in the continued investment in the network as an efficient notional company cannot recover efficiently incurred costs.

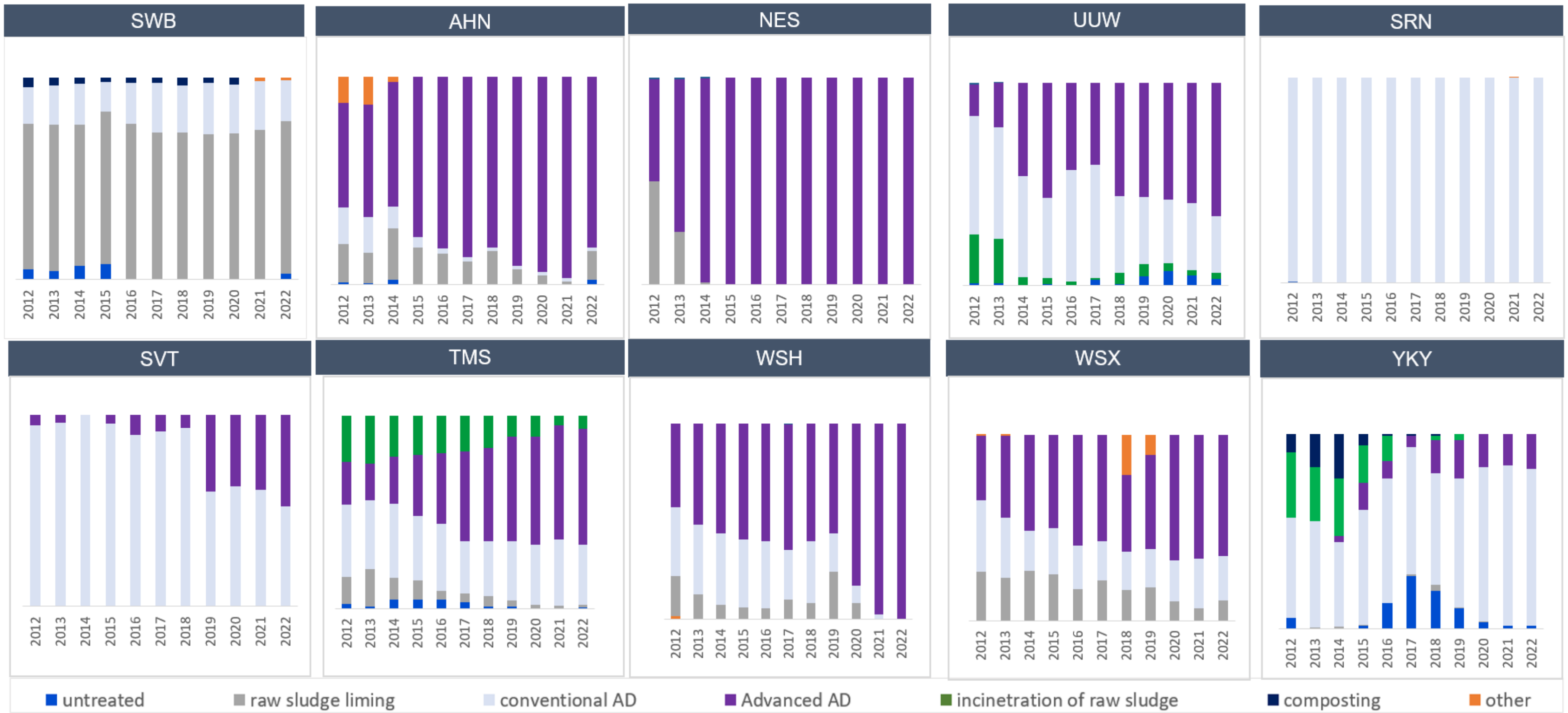
The appropriate treatment of power costs in base econometric models is crucial to ensure that cost allowances reflect the increased input cost pressures which water companies will face over next price control period due to recent developments in energy market. If companies are not fully compensated for the future requirements, then the disallowance of those efficient costs will create risks for the entire sector.

Owing to the Covid-19 pandemic, the conflict in Ukraine, climate challenges and Brexit, the water sector faces a potentially significant increase in cash-flow volatility and fluctuations in capital requirements over the next price control period. Even though the exact effect of all these is still unknown, the high volatility of prices and increased uncertainty is clear. If risks from increased energy prices are not mitigated, then the water sector will face an even riskier environment than during the previous price controls.

Water companies may not manage to earn their allowed rate of return on an expected basis if efficient energy costs are not recognised – breaching the ‘fair bet’ regulatory principle. The sector would then potentially have insufficient resources to provide adequate investment which could be reflected in the quality of service received by customers.

Annex A: Sludge treatment technology across the sector

Figure A1: Sludge by treatment technology from 2012 to 2022, by company



Annex B: Modelling results

Figure B1: Modelling results with an inclusion of energy price driver

Water resource plus and treated water distribution

	WRP						TWD					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12
BEIS electricity price index (log)	0.184	0.193	0.207	0.214	0.208	0.215	0.228***	0.199**	0.181**	0.221***	0.196**	0.183**
	{0.323}	{0.243}	{0.267}	{0.198}	{0.257}	{0.187}	{0.005}	{0.016}	{0.029}	{0.007}	{0.017}	{0.033}
Connected properties (log)	1.071***	1.072***	1.059***	1.063***	1.028***	1.030***						
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}						
Water treated at complexity levels 3 to 6 (%)	0.004**		0.003		0.003**							
	{0.039}		{0.157}		{0.040}							
Weighted average density - LAD from MSOA (log)	-1.395**	-1.365*					-2.546***			-2.811***		
	{0.025}	{0.058}					{0.000}			{0.000}		
Weighted average density - LAD from MSOA (log) squared	0.086**	0.083*					0.205***			0.217***		
	{0.032}	{0.073}					{0.000}			{0.000}		
Weighted average treatment complexity (log)		0.194		0.149		0.204						
		{0.363}		{0.520}		{0.335}						
Weighted average density – MSOA (log)			-4.888**	-5.037**				-5.300***			-6.284***	
			{0.030}	{0.044}				{0.000}			{0.000}	
Weighted average density – MSOA (log) squared			0.293**	0.302**				0.373***			0.427***	
			{0.031}	{0.046}				{0.000}			{0.000}	
Properties per length of mains (log)					-6.911*	-6.842*			-14.072***			-15.748***
					{0.072}	{0.091}			{0.000}			{0.000}
Properties per length of mains (log) squared					0.741*	0.731			1.789***			1.948***
					{0.098}	{0.121}			{0.000}			{0.000}
Length of mains (log)							1.063***	1.025***	1.068***	1.057***	1.017***	1.043***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Booster pumping stations per length of mains (log)							0.444***	0.393***	0.451***			
							{0.003}	{0.005}	{0.005}			
Average pumping head TWD (log)										0.332***	0.387***	0.336***
										{0.000}	{0.000}	{0.000}
Constant	-6.515***	-6.655***	8.31	8.864	4.381	4.215	2.46	13.701**	22.448***	0.542	14.822***	23.570***
	{0.001}	{0.003}	{0.328}	{0.352}	{0.586}	{0.619}	{0.143}	{0.016}	{0.000}	{0.739}	{0.000}	{0.000}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R_squared	0.906	0.899	0.899	0.894	0.908	0.902	0.957	0.954	0.96	0.962	0.966	0.966
RESET_P_value	0.771	0.633	0.846	0.765	0.768	0.612	0.814	0.479	0.767	0.797	0.892	0.683

Wholesale water

	WW											
	re13	re14	re15	re16	re17	re18	re19	re20	re21	re22	re23	re24
BEIS electricity price index (log)	0.177*	0.157*	0.184*	0.166*	0.177*	0.155*	0.175*	0.162*	0.191**	0.179**	0.182*	0.166*
	{0.074}	{0.091}	{0.064}	{0.072}	{0.071}	{0.092}	{0.060}	{0.053}	{0.037}	{0.032}	{0.052}	{0.053}
Connected properties (log)	1.069***	1.062***	1.056***	1.051***	1.043***	1.037***	1.063***	1.058***	1.046***	1.044***	1.025***	1.022***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Water treated at complexity levels 3 to 6 (%)	0.002**		0.002		0.002**		0.002		0.001		0.002	
	{0.037}		{0.175}		{0.032}		{0.141}		{0.425}		{0.105}	
Weighted average density - LAD from MSOA (log)	-1.741***	-1.612***					-2.039***	-1.955***				
	{0.001}	{0.002}					{0.000}	{0.000}				
Weighted average density - LAD from MSOA (log) squared	0.123***	0.114***					0.138***	0.131***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Weighted average treatment complexity (log)		0.257**		0.211*		0.263**		0.19		0.137		0.208*
		{0.028}		{0.086}		{0.021}		{0.136}		{0.281}		{0.082}
Weighted average density – MSOA (log)			-4.704***	-4.422***					-6.003***	-5.856***		
			{0.002}	{0.004}					{0.000}	{0.000}		
Weighted average density – MSOA (log) squared			0.299***	0.281***					0.372***	0.363***		
			{0.001}	{0.002}					{0.000}	{0.000}		
Properties per length of mains (log)					-10.705***	-10.093***					-11.938***	-11.525***
					{0.000}	{0.000}					{0.000}	{0.000}
Properties per length of mains (log) squared					1.245***	1.169***					1.363***	1.313***
					{0.000}	{0.000}					{0.000}	{0.000}
Length of mains (log)												
Booster pumping stations per length of mains (log)	0.439***	0.428***	0.468***	0.456***	0.342**	0.326*						
	{0.008}	{0.006}	{0.005}	{0.006}	{0.049}	{0.051}						
Average pumping head TWD (log)							0.329***	0.323***	0.337***	0.334***	0.267**	0.259**
							{0.002}	{0.003}	{0.003}	{0.004}	{0.033}	{0.042}
Constant	-3.089**	-3.576**	9.564*	8.424	13.745**	12.411**	-4.844***	-5.120***	11.999**	11.430**	14.500***	13.648***
	{0.039}	{0.018}	{0.099}	{0.145}	{0.015}	{0.024}	{0.007}	{0.004}	{0.018}	{0.030}	{0.001}	{0.001}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R_squared	0.965	0.966	0.963	0.965	0.965	0.967	0.965	0.965	0.963	0.963	0.966	0.966
RESET_P_value	0.696	0.49	0.74	0.53	0.689	0.42	0.978	0.989	0.873	0.933	0.936	0.898

Sewage collection, sewage treatment and wastewater network plus

	SWC								SWT			NP					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12	re13	re14	re15	re16	re17
BEIS electricity price index (log)	0.054 {0.666}	0.115 {0.327}	0.100 {0.395}	0.054 {0.666}	0.106 {0.359}	0.09 {0.437}	0.240* {0.067}	0.248* {0.061}	0.230* {0.055}	0.097 {0.254}	0.101 {0.231}	0.102 {0.228}	0.104 {0.208}	0.091 {0.289}	0.095 {0.270}	0.097 {0.259}	0.097 {0.254}
Sewer per length (log)	0.812*** {0.000}	0.880*** {0.000}	0.863*** {0.000}	0.850*** {0.000}	0.889*** {0.000}	0.874*** {0.000}											
Pumping capacity per length	0.341*** {0.008}	0.528*** {0.000}	0.496*** {0.000}	0.356*** {0.010}	0.516*** {0.000}	0.481*** {0.000}				0.328*** {0.000}	0.340*** {0.000}	0.314*** {0.000}	0.254*** {0.003}	0.322*** {0.000}	0.337*** {0.000}	0.310*** {0.000}	0.248*** {0.000}
Properties per sewer length (log)	0.985*** {0.000}			0.915*** {0.001}													
Weighted average density - LAD from MSOA (log)		0.193** {0.038}			0.225*** {0.000}												
Weighted average density – MSOA (log)			0.314** {0.019}			0.353*** {0.000}											
Urbain rainfall per length				0.114*** {0.000}	0.149*** {0.000}	0.147*** {0.000}								0.072** {0.024}	0.073** {0.017}	0.077** {0.018}	0.085** {0.016}
Load (log)							0.709*** {0.000}	0.790*** {0.000}	0.830*** {0.000}	0.657*** {0.000}	0.743*** {0.000}	0.707*** {0.000}	0.730*** {0.000}	0.661*** {0.000}	0.747*** {0.000}	0.726*** {0.000}	0.738*** {0.000}
Load treated in size bands 1 to 3 (%)							0.036 {0.206}				0.025* {0.075}				0.024** {0.030}		
Load treated with ammonia permit ≤ 3mg/l							0.004*** {0.000}	0.004*** {0.000}	0.004*** {0.000}	0.004*** {0.000}	0.004*** {0.000}	0.004*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.004*** {0.000}	0.005*** {0.000}	0.005*** {0.000}
Load treated in STWs ≥ 100,000 people (%)								- 0.009*** {0.001}				-0.003** {0.046}				-0.003*** {0.010}	
Weighted average treatment size									-0.239*** {0.000}				-0.097*** {0.010}				- 0.098*** {0.001}
Constant	-8.082***	- 6.928***	- 7.743***	- 7.912***	- 6.758***	- 7.682***	- 5.596***	- 6.003***	- 4.641***	- 3.551***	- 4.767***	- 4.068***	- 3.558***	- 3.370***	- 4.572***	- 4.027***	- 3.365***
N	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
R_squared	0.917	0.892	0.892	0.919	0.911	0.91	0.866	0.88	0.917	0.948	0.953	0.95	0.957	0.954	0.959	0.957	0.964
RESET_P_value	0.371	0.452	0.382	0.134	0.449	0.381	0.04	0.151	0.303	0.345	0.234	0.413	0.5	0.149	0.05	0.002	0.078

Notes: *** indicates 1% significance level; ** indicates 5% significance level; * indicates 10% significance level. The results are based on a ‘random effects’ estimation for the panel data

Figure B2: Modelling results with pre-modelling adjustment

Water resource plus and treated water distribution

	WRP						TWD					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12
Connected properties (log)	1.072***	1.073***	1.055***	1.059***	1.029***	1.029***						
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}						
Water treated at complexity levels 3 to 6 (%)	0.004***		0.004**		0.004***							
	{0.006}		{0.027}		{0.003}							
Weighted average density - LAD from MSOA (log)	-1.462**	-1.410**					-2.684***			-2.936***		
	{0.013}	{0.039}					{0.000}			{0.000}		
Weighted average density - LAD from MSOA (log) squared	0.091**	0.087**					0.216***			0.226***		
	{0.017}	{0.048}					{0.000}			{0.000}		
Weighted average treatment complexity (log)		0.276		0.244		0.297						
		{0.276}		{0.351}		{0.227}						
Weighted average density – MSOA (log)			-4.933**	-5.045**				-5.471***			-6.473***	
			{0.022}	{0.038}				{0.000}			{0.000}	
Weighted average density – MSOA (log) squared			0.298**	0.304**				0.386***			0.441***	
			{0.022}	{0.038}				{0.000}			{0.000}	
Properties per length of mains (log)					-7.578**	-7.340**			-14.517***			-16.287***
					{0.034}	{0.047}			{0.000}			{0.000}
Properties per length of mains (log) squared					0.825**	0.794*			1.848***			2.015***
					{0.049}	{0.065}			{0.000}			{0.000}
Length of mains (log)							1.068***	1.025***	1.071***	1.061***	1.017***	1.045***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Booster pumping stations per length of mains (log)							0.458***	0.425***	0.483***			
							{0.002}	{0.001}	{0.001}			
Average pumping head TWD (log)										0.351***	0.405***	0.352***
										{0.000}	{0.000}	{0.000}
Constant	-5.503***	-5.712***	9.339	9.737	6.63	6.098	4.008**	15.301***	24.230***	1.893	16.360***	25.457***
	{0.000}	{0.003}	{0.243}	{0.288}	{0.368}	{0.426}	{0.012}	{0.003}	{0.000}	{0.232}	{0.000}	{0.000}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R_squared	0.908	0.9	0.899	0.894	0.909	0.903	0.956	0.953	0.959	0.961	0.965	0.966
RESET_P_value	0.539	0.499	0.858	0.821	0.462	0.359	0.124	0.166	0.586	0.414	0.706	0.676

Wholesale water

	WW											
	re13	re14	re15	re16	re17	re18	re19	re20	re21	re22	re23	re24
Connected properties (log)	1.071***	1.061***	1.053***	1.048***	1.044***	1.037***	1.065***	1.059***	1.043***	1.040***	1.025***	1.021***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Water treated at complexity levels 3 to 6 (%)	0.003***		0.002**		0.003***		0.002**		0.002		0.003**	
	{0.004}		{0.024}		{0.002}		{0.040}		{0.122}		{0.020}	
Weighted average density - LAD from MSOA (log)	-1.807***	-1.634***					-2.130***	-2.011***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Weighted average density - LAD from MSOA (log) squared	0.128***	0.116***					0.144***	0.136***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Weighted average treatment complexity (log)		0.313**		0.277**		0.322**		0.244		0.209		0.273*
		{0.022}		{0.047}		{0.011}		{0.102}		{0.159}		{0.050}
Weighted average density – MSOA (log)			-4.686***	-4.355***					-6.117***	-5.908***		
			{0.001}	{0.002}					{0.000}	{0.000}		
Weighted average density – MSOA (log) squared			0.301***	0.278***					0.381***	0.367***		
			{0.001}	{0.002}					{0.000}	{0.000}		
Properties per length of mains (log)					-11.036***	-10.210***					-12.483***	-11.832***
					{0.000}	{0.000}					{0.000}	{0.000}
Properties per length of mains (log) squared					1.289***	1.186***					1.431***	1.351***
					{0.000}	{0.000}					{0.000}	{0.000}
Length of mains (log)												
Booster pumping stations per length of mains (log)	0.454***	0.440***	0.498***	0.477***	0.367**	0.343**						
	{0.007}	{0.005}	{0.003}	{0.003}	{0.036}	{0.037}						
Average pumping head TWD (log)							0.339***	0.331***	0.351***	0.344***	0.273**	0.261**
							{0.001}	{0.002}	{0.002}	{0.003}	{0.026}	{0.038}
Constant	-2.055	-2.792*	10.345*	8.907	15.231***	13.338**	-3.828**	-4.282**	13.168***	12.302**	16.385***	14.969***
	{0.188}	{0.068}	{0.063}	{0.109}	{0.007}	{0.013}	{0.028}	{0.014}	{0.009}	{0.020}	{0.000}	{0.000}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R_squared	0.965	0.966	0.963	0.965	0.965	0.967	0.965	0.965	0.962	0.962	0.966	0.966
RESET_P_value	0.243	0.148	0.285	0.17	0.313	0.148	0.878	0.911	0.807	0.881	0.869	0.793

Sewage collection, sewage treatment and network plus

	SWC								SWT			NP					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12	re13	re14	re15	re16	re17
Sewer per length (log)	0.813*** {0.000}	0.889*** {0.000}	0.865*** {0.000}	0.852*** {0.000}	0.896*** {0.000}	0.876*** {0.000}											
Pumping capacity per length	0.346*** {0.009}	0.574*** {0.000}	0.531*** {0.001}	0.361** {0.012}	0.550*** {0.000}	0.508*** {0.001}				0.340*** {0.001}	0.353*** {0.002}	0.329*** {0.003}	0.268** {0.011}	0.331*** {0.001}	0.347*** {0.001}	0.322*** {0.001}	0.256*** {0.001}
Properties per sewer length (log)	0.995*** {0.000}			0.926*** {0.000}													
Weighted average density - LAD from MSOA (log)		0.205** {0.027}			0.234*** {0.000}												
Weighted average density – MSOA (log)			0.340*** {0.008}			0.372*** {0.000}											
Urbain rainfall per length				0.115*** {0.000}	0.152*** {0.000}	0.149*** {0.000}								0.073** {0.016}	0.074*** {0.010}	0.079** {0.011}	0.086*** {0.010}
Load (log)							0.684*** {0.000}	0.758*** {0.000}	0.814*** {0.000}	0.656*** {0.000}	0.740*** {0.000}	0.704*** {0.000}	0.727*** {0.000}	0.661*** {0.000}	0.745*** {0.000}	0.724*** {0.000}	0.736*** {0.000}
Load treated in size bands 1 to 3 (%)							0.033 {0.213}				0.024* {0.076}				0.024** {0.031}		
Load treated with ammonia permit ≤ 3mg/l							0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}	0.005*** {0.000}
Load treated in STWs ≥ 100,000 people (%)								-0.009*** {0.002}				-0.003* {0.096}				-0.003** {0.033}	
Weighted average treatment size									-0.242*** {0.000}				-0.095** {0.013}				-0.097*** {0.002}
Constant	-7.876*** {0.000}	-6.569*** {0.000}	-7.494*** {0.000}	-7.711*** {0.000}	-6.393*** {0.000}	-7.424*** {0.000}	-4.123*** {0.002}	-4.463*** {0.000}	-3.318*** {0.000}	-3.086*** {0.000}	-4.255*** {0.000}	-3.549*** {0.000}	-3.048*** {0.000}	-2.932*** {0.000}	-4.092*** {0.000}	-3.540*** {0.000}	-2.885*** {0.000}
N	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
R_squared	0.917	0.89	0.891	0.919	0.91	0.909	0.859	0.873	0.914	0.948	0.953	0.95	0.957	0.954	0.959	0.957	0.965
RESET_P_value	0.27	0.144	0.114	0.08	0.213	0.188	0.115	0.326	0.914	0.495	0.437	0.667	0.866	0.095	0.025	0.001	0.115

Notes: *** indicates 1% significance level; ** indicates 5% significance level; * indicates 10% significance level. The results are based on a ‘random effects’ estimation for the panel data

Figure B3: Modelling results with 2021-22-year dummy

Water resource plus and treated water distribution

	WRP						TWD					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12
2021-22 year dummy	0.022	0.021	0.025	0.024	0.027	0.026	0.037	0.03	0.019	0.035	0.03	0.021
	{0.712}	{0.687}	{0.666}	{0.643}	{0.636}	{0.609}	{0.313}	{0.406}	{0.583}	{0.303}	{0.367}	{0.532}
Connected properties (log)	1.076***	1.075***	1.054***	1.056***	1.029***	1.028***						
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}						
Water treated at complexity levels 3 to 6 (%)	0.005***		0.004**		0.005***							
	{0.003}		{0.012}		{0.001}							
Weighted average density - LAD from MSOA (log)	-1.555***	-1.490**					-2.712***			-2.955***		
	{0.006}	{0.025}					{0.000}			{0.000}		
Weighted average density - LAD from MSOA (log) squared	0.098***	0.093**					0.218***			0.227***		
	{0.007}	{0.029}					{0.000}			{0.000}		
Weighted average treatment complexity (log)		0.322		0.294		0.343						
		{0.188}		{0.244}		{0.149}						
Weighted average density – MSOA (log)			-5.050**	-5.130**				-5.510***			-6.498***	
			{0.017}	{0.033}				{0.000}			{0.000}	
Weighted average density – MSOA (log) squared			0.307**	0.311**				0.390***			0.442***	
			{0.017}	{0.032}				{0.000}			{0.000}	
Properties per length of mains (log)					-7.947**	-7.685**			-14.734***			-16.471***
					{0.016}	{0.026}			{0.000}			{0.000}
Properties per length of mains (log) squared					0.872**	0.839**			1.877***			2.037***
					{0.024}	{0.036}			{0.000}			{0.000}
Length of mains (log)							1.069***	1.026***	1.072***	1.061***	1.017***	1.045***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Booster pumping stations per length of mains (log)							0.466***	0.434***	0.495***			
							{0.002}	{0.001}	{0.001}			
Average pumping head TWD (log)										0.353***	0.407***	0.352***
										{0.000}	{0.000}	{0.000}
Constant	-5.275***	-5.556***	9.689	9.936	7.298	6.69	4.114***	15.457***	24.680***	1.944	16.438***	25.826***
	{0.001}	{0.003}	{0.220}	{0.274}	{0.288}	{0.354}	{0.008}	{0.002}	{0.000}	{0.223}	{0.000}	{0.000}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R_squared	0.908	0.901	0.9	0.895	0.91	0.904	0.955	0.952	0.958	0.961	0.965	0.966
RESET_P_value	0.486	0.42	0.762	0.662	0.459	0.341	0.169	0.193	0.626	0.438	0.749	0.745

Wholesale water

	WW											
	re13	re14	re15	re16	re17	re18	re19	re20	re21	re22	re23	re24
2021-22 year dummy	0.02	0.015	0.021	0.016	0.018	0.013	0.019	0.015	0.021	0.017	0.02	0.015
	{0.618}	{0.686}	{0.607}	{0.666}	{0.654}	{0.725}	{0.614}	{0.663}	{0.570}	{0.617}	{0.611}	{0.666}
Connected properties (log)	1.072***	1.061***	1.052***	1.046***	1.044***	1.037***	1.065***	1.058***	1.042***	1.038***	1.025***	1.020***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Water treated at complexity levels 3 to 6 (%)	0.003***		0.003**		0.003***		0.003**		0.002*		0.003**	
	{0.002}		{0.014}		{0.001}		{0.031}		{0.091}		{0.016}	
Weighted average density - LAD from MSOA (log)	-1.840***	-1.645***					-2.153***	-2.011***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Weighted average density - LAD from MSOA (log) squared	0.131***	0.117***					0.146***	0.136***				
	{0.000}	{0.000}					{0.000}	{0.000}				
Weighted average treatment complexity (log)		0.347**		0.313**		0.352***		0.287*		0.251		0.306**
		{0.013}		{0.026}		{0.007}		{0.064}		{0.101}		{0.035}
Weighted average density – MSOA (log)			-4.689***	-4.322***					-6.107***	-5.860***		
			{0.001}	{0.002}					{0.000}	{0.000}		
Weighted average density – MSOA (log) squared			0.302***	0.277***					0.381***	0.365***		
			{0.000}	{0.001}					{0.000}	{0.000}		
Properties per length of mains (log)					-11.233***	-10.354***					-12.694***	-11.992***
					{0.000}	{0.000}					{0.000}	{0.000}
Properties per length of mains (log) squared					1.316***	1.206***					1.458***	1.372***
					{0.000}	{0.000}					{0.000}	{0.000}
Length of mains (log)												
Booster pumping stations per length of mains (log)	0.458***	0.444***	0.508***	0.486***	0.382**	0.355**						
	{0.008}	{0.005}	{0.003}	{0.003}	{0.033}	{0.033}						
Average pumping head TWD (log)							0.342***	0.332***	0.356***	0.348***	0.281**	0.268**
							{0.001}	{0.002}	{0.002}	{0.003}	{0.021}	{0.032}
Constant	-1.974	-2.795*	10.330*	8.74	15.614***	13.600***	-3.805**	-4.344**	13.060**	12.036**	16.734***	15.203***
	{0.199}	{0.065}	{0.057}	{0.108}	{0.003}	{0.007}	{0.032}	{0.014}	{0.010}	{0.023}	{0.000}	{0.000}
Number of observations	187	187	187	187	187	187	187	187	187	187	187	187
R_squared	0.965	0.967	0.963	0.965	0.965	0.967	0.965	0.965	0.961	0.962	0.966	0.967
RESET_P_value	0.213	0.111	0.246	0.126	0.323	0.142	0.853	0.889	0.781	0.87	0.927	0.849

Sewage collection, sewage treatment and wastewater network plus

	SWC								SWT			NP					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12	re13	re14	re15	re16	re17
2021-22 year dummy	0.03	0.048	0.044	0.046	0.066	0.062	0.109**	0.112**	0.108**	0.059	0.059	0.061	0.061	0.069*	0.069*	0.072*	0.072*
	{0.595}	{0.389}	{0.418}	{0.426}	{0.230}	{0.253}	{0.034}	{0.028}	{0.031}	{0.147}	{0.145}	{0.134}	{0.128}	{0.087}	{0.088}	{0.073}	{0.067}
Sewer per length (log)	0.808***	0.883***	0.859***	0.851***	0.889***	0.870***											
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}											
Pumping capacity per length	0.341***	0.559***	0.518***	0.354***	0.528***	0.486***				0.337***	0.350***	0.325***	0.265***	0.320***	0.337***	0.309***	0.247***
	{0.008}	{0.000}	{0.000}	{0.009}	{0.000}	{0.001}				{0.000}	{0.001}	{0.001}	{0.005}	{0.000}	{0.000}	{0.001}	{0.001}
Properties per sewer length (log)	1.011***			0.923***													
	{0.000}			{0.000}													
Weighted average density - LAD from MSOA (log)		0.206**			0.237***												
		{0.024}			{0.000}												
Weighted average density – MSOA (log)			0.341***			0.374***											
			{0.007}			{0.000}											
Urbain rainfall per length				0.125***	0.167***	0.163***								0.090***	0.091***	0.096***	0.101***
				{0.000}	{0.000}	{0.000}								{0.002}	{0.001}	{0.001}	{0.001}
Load (log)							0.660***	0.741***	0.798***	0.645***	0.727***	0.693***	0.718***	0.651***	0.734***	0.718***	0.729***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Load treated in size bands 1 to 3 (%)							0.03				0.024*				0.023**		
							{0.217}				{0.079}				{0.035}		
Load treated with ammonia permit ≤ 3mg/l							0.006***	0.006***	0.006***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Load treated in STWs ≥ 100,000 people (%)								-0.009***				-0.003				-0.003**	
								{0.005}				{0.108}				{0.019}	
Weighted average treatment size									-0.241***				-0.096**				-0.100***
									{0.000}				{0.013}				{0.002}
Constant	-7.880***	-6.506***	-7.441***	-7.659***	-6.289***	-7.328***	-3.822***	-4.266***	-3.130***	-2.957***	-4.094***	-3.414***	-2.922***	-2.759***	-3.900***	-3.401***	-2.732***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.002}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
N	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
R_squared	0.917	0.891	0.891	0.919	0.912	0.911	0.86	0.874	0.915	0.948	0.953	0.95	0.957	0.955	0.961	0.959	0.966
RESET_P_value	0.41	0.367	0.311	0.138	0.483	0.425	0.105	0.358	0.569	0.463	0.332	0.573	0.689	0.229	0.029	0.005	0.072

Notes: *** indicates 1% significance level; ** indicates 5% significance level; * indicates 10% significance level. The results are based on a ‘random effects’ estimation for the panel data

Figure B4: Modelling results when 2022 year is excluded

Water resource plus and treated water distribution

	WRP						TWD					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12
Connected properties (log)	1.065*** {0.000}	1.065*** {0.000}	1.046*** {0.000}	1.051*** {0.000}	1.021*** {0.000}	1.021*** {0.000}						
Water treated at complexity levels 3 to 6 (%)	0.006*** {0.000}		0.005*** {0.003}		0.006*** {0.000}							
Weighted average density - LAD from MSOA (log)	-1.467*** {0.009}	-1.377** {0.035}					-2.709*** {0.000}			-3.030*** {0.000}		
Weighted average density - LAD from MSOA (log) squared	0.091** {0.012}	0.084** {0.044}					0.218*** {0.000}			0.233*** {0.000}		
Weighted average treatment complexity (log)		0.354 {0.122}		0.324 {0.176}		0.384* {0.083}						
Weighted average density – MSOA (log)			-4.684** {0.020}	-4.794** {0.042}				-5.537*** {0.000}			-6.762*** {0.000}	
Weighted average density – MSOA (log) squared			0.282** {0.020}	0.288** {0.043}				0.392*** {0.000}			0.459*** {0.000}	
Properties per length of mains (log)					-7.076** {0.029}	-6.500* {0.057}			-15.306*** {0.000}			-17.545*** {0.000}
Properties per length of mains (log) squared					0.762** {0.046}	0.690* {0.083}			1.943*** {0.000}			2.161*** {0.000}
Length of mains (log)							1.066*** {0.000}	1.023*** {0.000}	1.070*** {0.000}	1.059*** {0.000}	1.015*** {0.000}	1.042*** {0.000}
Booster pumping stations per length of mains (log)							0.515*** {0.001}	0.474*** {0.001}	0.520*** {0.001}			
Average pumping head TWD (log)										0.341*** {0.000}	0.398*** {0.000}	0.347*** {0.000}
Constant	-5.481*** {0.001}	-5.834*** {0.002}	8.383 {0.268}	8.762 {0.326}	5.636 {0.400}	4.381 {0.535}	4.319*** {0.007}	15.731*** {0.003}	26.036*** {0.000}	2.291 {0.191}	17.561*** {0.000}	28.201*** {0.000}
Number of observations	170	170	170	170	170	170	170	170	170	170	170	170
R_squared	0.912	0.904	0.904	0.898	0.916	0.909	0.954	0.952	0.957	0.959	0.963	0.964
RESET_P_value	0.421	0.342	0.739	0.716	0.32	0.163	0.087	0.12	0.488	0.432	0.699	0.838

Wholesale water

	WW											
	re13	re14	re15	re16	re17	re18	re19	re20	re21	re22	re23	re24
Connected properties (log)	1.065***	1.055***	1.045***	1.040***	1.037***	1.029***	1.060***	1.053***	1.036***	1.033***	1.019***	1.015***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Water treated at complexity levels 3 to 6 (%)	0.004***		0.003***		0.004***		0.003**		0.003**		0.003***	
	{0.000}		{0.004}		{0.000}		{0.010}		{0.038}		{0.005}	
Weighted average density - LAD from MSOA (log)	-1.840***	-1.633***					-2.211***	-2.059***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Weighted average density - LAD from MSOA (log) squared	0.131***	0.116***					0.150***	0.139***				
	{0.000}	{0.001}					{0.000}	{0.000}				
Weighted average treatment complexity (log)		0.368***		0.335**		0.391***		0.302**		0.269*		0.339**
		{0.005}		{0.010}		{0.001}		{0.038}		{0.061}		{0.012}
Weighted average density – MSOA (log)			-4.632***	-4.288***					-6.230***	-6.002***		
			{0.002}	{0.003}					{0.000}	{0.000}		
Weighted average density – MSOA (log) squared			0.298***	0.274***					0.389***	0.373***		
			{0.001}	{0.002}					{0.000}	{0.000}		
Properties per length of mains (log)					-11.658***	-10.659***					-13.437***	-12.562***
					{0.000}	{0.000}					{0.000}	{0.000}
Properties per length of mains (log) squared					1.360***	1.236***					1.541***	1.434***
					{0.000}	{0.000}					{0.000}	{0.000}
Length of mains (log)												
Booster pumping stations per length of mains (log)	0.477***	0.459***	0.523***	0.495***	0.366**	0.338**						
	{0.003}	{0.003}	{0.001}	{0.002}	{0.015}	{0.020}						
Average pumping head TWD (log)							0.319***	0.312***	0.331***	0.324***	0.248**	0.236**
							{0.002}	{0.003}	{0.002}	{0.004}	{0.022}	{0.043}
Constant	-1.846	-2.717*	10.224*	8.714	16.602***	14.326***	-3.458*	-4.031**	13.714**	12.765**	18.566***	16.669***
	{0.259}	{0.086}	{0.070}	{0.121}	{0.001}	{0.003}	{0.075}	{0.034}	{0.013}	{0.024}	{0.000}	{0.000}
Number of observations	170	170	170	170	170	170	170	170	170	170	170	170
R_squared	0.965	0.967	0.963	0.965	0.967	0.969	0.965	0.965	0.961	0.962	0.967	0.968
RESET_P_value	0.168	0.076	0.183	0.077	0.204	0.071	0.846	0.824	0.903	0.932	0.774	0.607

Sewage collection, sewage treatment and wastewater network plus

	SWC								SWT			NP					
	re1	re2	re3	re4	re5	re6	re7	re8	re9	re10	re11	re12	re13	re14	re15	re16	re17
Sewer per length (log)	0.820***	0.896***	0.874***	0.867***	0.903***	0.885***											
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}											
Pumping capacity per length	0.334***	0.552***	0.512***	0.349***	0.521***	0.480***				0.344***	0.356***	0.334***	0.265***	0.327***	0.340***	0.313***	0.240***
	{0.001}	{0.000}	{0.000}	{0.001}	{0.000}	{0.000}				{0.000}	{0.000}	{0.000}	{0.006}	{0.000}	{0.000}	{0.000}	{0.001}
Properties per sewer length (log)	0.967***			0.867***													
	{0.000}			{0.001}													
Weighted average density - LAD from MSOA (log)		0.195**			0.225***												
		{0.047}			{0.001}												
Weighted average density – MSOA (log)			0.323**			0.354***											
			{0.022}			{0.001}											
Urbain rainfall per length				0.130***	0.164***	0.161***								0.088***	0.089***	0.094***	0.099***
				{0.000}	{0.000}	{0.000}								{0.003}	{0.002}	{0.002}	{0.002}
Load (log)							0.660***	0.745***	0.794***	0.649***	0.736***	0.700***	0.722***	0.656***	0.741***	0.725***	0.733***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Load treated in size bands 1 to 3 (%)							0.03				0.025*				0.024**		
							{0.199}				{0.091}				{0.045}		
Load treated with ammonia permit ≤ 3mg/l							0.006***	0.006***	0.006***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
							{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Load treated in STWs ≥ 100,000 people (%)								-0.009**				-0.003				-0.003*	
								{0.010}				{0.159}				{0.052}	
Weighted average treatment size									-0.242***				-0.097**				-0.099***
									{0.000}				{0.015}				{0.003}
Constant	-7.845***	-6.574***	-7.457***	-7.607***	-6.355***	-7.338***	-3.826***	-4.311***	-3.088***	-3.012***	-4.210***	-3.502***	-2.975***	-2.830***	-4.001***	-3.497***	-2.792***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.002}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
R_squared	0.918	0.888	0.888	0.921	0.911	0.91	0.86	0.874	0.915	0.947	0.952	0.949	0.956	0.955	0.961	0.959	0.966
RESET_P_value	0.337	0.305	0.253	0.163	0.399	0.359	0.055	0.269	0.849	0.538	0.445	0.664	0.887	0.239	0.04	0.003	0.22

Notes: *** indicates 1% significance level; ** indicates 5% significance level; * indicates 10% significance level. The results are based on a 'random effects' estimation for the panel data

Annex C: Efficiency scores

Triangulated Water

Ofwat		Inclusion of a driver		Pre-modelling adjustment		Inclusion of a 2021-22 year dummy		excluding 2021-22 year	
PRT	0.79	PRT	0.76	PRT	0.78	PRT	0.79	PRT	0.79
SSC	0.83	SSC	0.81	SSC	0.82	SSC	0.83	SSC	0.84
SWB	0.91	SWB	0.89	SWB	0.90	SWB	0.91	SWB	0.91
AFW	1.01	AFW	1.00	ANH	1.03	AFW	1.01	AFW	1.01
SVE	1.04	SEW	1.01	SEW	1.02	SVE	1.03	HDD	1.02
SEW	1.04	ANH	1.01	AFW	1.00	SEW	1.03	SEW	1.04
TMS	1.05	SVE	1.01	SVE	1.03	ANH	1.04	SVE	1.05
ANH	1.05	HDD	1.02	NWT	1.05	HDD	1.05	ANH	1.05
HDD	1.05	NWT	1.03	HDD	1.04	TMS	1.05	NES	1.06
NWT	1.06	NES	1.04	NES	1.05	NWT	1.05	NWT	1.06
NES	1.06	TMS	1.08	TMS	1.06	NES	1.06	TMS	1.06
YKY	1.11	YKY	1.09	YKY	1.11	YKY	1.11	YKY	1.11
WSH	1.15	WSH	1.12	BRL	1.16	WSH	1.14	WSH	1.13
BRL	1.16	BRL	1.15	WSH	1.14	BRL	1.16	BRL	1.15
WSX	1.26	WSX	1.19	WSX	1.24	WSX	1.25	WSX	1.26
SES	1.32	SES	1.30	SES	1.31	SES	1.31	SES	1.31
SRN	1.36	SRN	1.34	SRN	1.36	SRN	1.36	SRN	1.36
Average	1.07	Average	1.05	Average	1.06	Average	1.07	Average	1.07
UQ	1.02	UQ	1.00	UQ	1.01	UQ	1.02	UQ	1.01
Range	0.57	Range	0.58	Range	0.58	Range	0.57	Range	0.57

Triangulated wastewater (network plus)

Ofwat		Inclusion of a driver		Pre-modelling adjustment		Inclusion of a 2021-22 year dummy		excluding 2021-22 year	
WSX	0.93	WSX	0.90	WSX	0.92	WSX	0.90	WSX	0.93
TMS	0.97	ANH	0.98	TMS	0.97	ANH	0.98	TMS	0.99
SWB	1.00	SWB	0.98	SWB	0.98	SWB	0.98	SWB	1.01
NES	1.00	NES	0.98	NES	0.99	NES	0.98	ANH	1.01
ANH	1.01	TMS	0.99	ANH	0.99	TMS	0.99	NES	1.01
NWT	1.04	NWT	1.03	NWT	1.04	NWT	1.03	NWT	1.05
YKY	1.06	WSH	1.04	WSH	1.05	WSH	1.04	YKY	1.07
WSH	1.07	YKY	1.05	YKY	1.06	YKY	1.05	WSH	1.07
SRN	1.09	SRN	1.09	SRN	1.09	SRN	1.09	SRN	1.12
Average	1.02	Average	1.01	Average	1.01	Average	1.01	Average	1.03
UQ	0.99	UQ	0.98	UQ	0.98	UQ	0.98	UQ	1.00
Range	0.16	Range	0.19	Range	0.18	Range	0.19	Range	0.19

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APPENDIX SES005

E. SMALL COMPANY PREMIUM EVIDENCE

Contents

SES005 E. SMALL COMPANY PREMIUM EVIDENCE

A. Executive Summary

1. Sutton and East Surrey Water (SESW) is significantly smaller than the average water company in the sector. This affects our costs of debt which have a different profile and are considerably higher than the notional efficient sector average.
2. The efficient cost of debt differs with the different business characteristics, investment profile, and size and scale, of the individual licensee. It is important that as part of the regulatory framework that Ofwat accords licensees their efficient cost of financing and as part of this their efficient cost of debt.
3. As a result of our small RCV and particular business characteristics we face a choice of either raising debt of smaller ticket size (below benchmark), infrequent issuance (as has been the case) or raising other sources of debt which would ultimately be more expensive.
4. Ofwat has proposed a 30bps uplift in the cost of embedded debt for smaller WoCs as part of its Final Methodology but has proposed no such adjustment or uplift in the treatment of new cost of debt.
5. The 30bps uplift in respect of embedded debt is significantly lower than that which we have estimated would be necessary to cover our estimated cost of embedded debt for the period and an uplift of closer to 150bps would in fact be necessary.
6. There is no suggestion our actual debt, which is based upon a single instrument, is inefficient and we present summary evidence in support of this. As a result we believe Ofwat should give careful consideration to providing for our actual cost of embedded debt as part of PR24 and that this would be consistent with the provision of efficient costs and the discharge by Ofwat of its statutory duties.
7. In relation to new debt, we set out the regulatory precedent from Ofgem which provides for an uplift of 26bps in the case of smaller electricity distribution network operators which are significantly greater in size than we are. This represents a useful benchmark to the scale of uplift which may be required but again we believe that Ofwat should give careful consideration to the provision of actual costs of new debt going forward where efficiently incurred.
8. Finally, we believe that a further 10bps should be added to our cost of debt uplifts (embedded and new debt) for additional cost associated with cost of carry.

B. Introduction

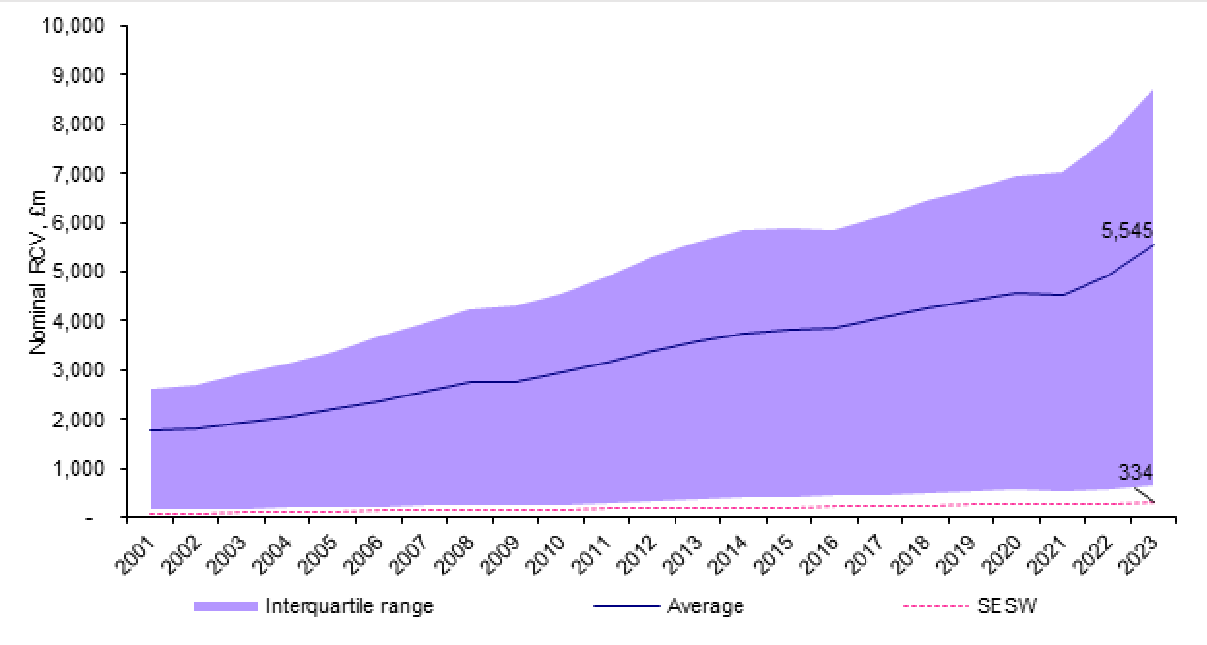
9. As one of the smallest companies in the water sector we (SESW) face a number of issues and risks that are different to our larger counterparts, notably in relation to debt issuance. The company's small size and infrequent issuance means that we are affected differently by market factors than our larger counterparts; however, these nuances are currently largely not taken into account by Ofwat. This annex will outline SESW's characteristics, how these affect debt issuances, and the resulting risks that SESW faces.
10. A company of SESW's small size and associated business characteristics will inherently incur higher costs on new debt and has higher borrowing costs historically. Ofwat's PR24 methodology does not sufficiently account for the additional risks, higher cost of new debt, nuances and additional challenges faced by SESW and other small water

companies. This annex presents and analyses these issues and suggests how Ofwat should provide for small water companies as well as their larger counterparts as part of the Draft Determination. Ultimately, this will benefit all parties – consumers, Ofwat and SESW and other small water companies – by ensuring an efficient and fairer price for the consumer and the ongoing operational viability of small water companies.

C. Context

11. SESW has historically been and continues to be one of the smallest companies in the sector, with an RCV typically 16-18x smaller than that of the average water company. SESW ranks below the 25th percentile in terms of RCV of the water sector.

Figure 1: SESW's relative size (RCV) to the water sector[1]



12. As a result, SESW has a low financing requirement in absolute terms compared to the average water company. Given the benchmark size for debt placement which stands currently at £250m in the context of the iBoxx index[2] .it is also subject to infrequent issuance and debt placement. This is borne out by SESW's actual issuance profile which is comprised of a single long-term issuance over the last 22 years (last issuance in March 2001). [3]
13. This infrequent issuance profile implies that SESW is exposed to additional risks relative to larger companies the sector that issue debt more frequently.
14. Ofwat, Ofgem and the CMA have all recognised that small companies face additional risks that need to be priced.
15. The CMA determined an overall cost of debt allowance that was 17bps higher for Bristol Water (BRL) than for the wider industry during PR19. SESW's RCV has historically been c. 1.5-2.1x smaller than BRL's which suggests, all else equal, that incremental borrowing costs incurred by a company like SESW would be expected to exceed those efficiently incurred by BRL.

[1] Interquartile range is the range between RCV of £645m (25th percentile) and £8,715m (75th percentile)
[2] Based on the minimum threshold for inclusion in iBoxx indices which currently stands at £250m and was £100m before 2011. Markit iBoxx GBP Benchmark Index Guide May 2023, Pg. 7
[3] SES current debt book comprises of 1 long term index linked debt (Original issuance - £100m, Current outstanding - £201.3) and 2 full drawn RCF facilities (Facility size - £50m and £25m), which are used to finance the RCV

16. Ofgem recognised as part of RIIO-2 that companies issuing less than £250m per annum (emphasis added) on a notional licensee basis are infrequent issuers and awarded them a premium of 6bps. [4] SESW's RCV – both on a historical and projected basis – implies a lower annual issuance than that of the smallest electricity distribution network which suggests, all else equal, that incremental borrowing costs incurred by a company such as SESW would be expected to exceed those of an efficiently financed small electricity distribution network operator. [5]
17. For PR24, Ofwat has signalled an uplift of 30bps over the sector cost of embedded debt allowance for the notional small water only company in recognition of the ongoing impact that the long-dated debt issued in the early 2000s has on the projected embedded debt costs. [6] No additional provision has been made for the higher cost of new debt.
18. However, the proposed uplift of 30bps is not likely to be sufficient to address the gap between our efficiently incurred cost of embedded debt and the allowance based on WaSC and large WoC costs.[7] Moreover, Ofwat should also take into account the fact that a notional company of SESW's small size and associated business characteristics would reasonably be expected to incur higher costs on new debt and borrowing costs.
19. Small local water companies are better suited to innovation, agile decision making and consumer orientation than their larger counterparts. [8] It is therefore in the interest of all parties (consumers, Ofwat and small local water companies) and consistent with the discharge by Ofwat of its statutory duties, for Ofwat to reconsider the allowance for small water companies.
20. In doing so Ofwat should take into consideration the additional risks these companies face (outlined in the following section). As a water company licensed by Ofwat, SESW operates on the basis that it should be entitled to recover its economically efficient costs. This includes the costs we efficiently incur in relation to the cost of servicing debt on the RCV, which result from our relatively small scale relative to other companies in the sector.

D. Additional risks faced by small, infrequent issuers

21. Small, infrequent issuers are exposed to a number of additional risks as a direct result of these characteristics. These risks are detailed in this section and can be summarised as follows:
    1. For small issuers, each issuance represents a more material proportion of the debt book and thus has a more material impact on the overall cost of debt.
    2. Before issuing long term benchmark size bonds, small issuers often need to rely on sub-benchmark size short term financing from other non-public and alternative markets, which is more expensive than long term financing (benchmark size public bonds)
    3. Infrequent issuers have less control over the timing of issuance at benchmark size than larger issuers.
    4. The timing of debt issuance can have a material impact on the cost of debt as interest rates fluctuate. For an infrequent debt issuer, the capital structure which allows the greatest stability will contain a greater proportion of index-linked debt
    5. Raising debt at longer tenors is a key tool for smaller issuers to manage short-term refinancing risk; however longer tenors expose issuers to additional risks. Therefore,

[4] Ofgem ED2 – Finance Annex – Pg. 9
[5] Ofgem ED2 – Finance Annex – Pg. 19
[6] PR24 FM - Appendix 11 – Allowed return on capital Pg. 89
[7] We comment on the efficiency of our debt costs in Section 3.2
[8] As illustrated in the EY 2018 report on "The value of small local water only companies"

infrequent issuers are exposed to additional risks which Ofwat needs to take into account.

22. Ofwat's final methodology notes that an important principle in setting a company-specific adjustment is that they should compensate for factors substantively outside of management control. [9]

23. SESW faces additional risks on cost of debt relative to its larger counterparts in the industry, due to inherent factors resulting from its small size and associated business characteristics. Ofwat should account for these additional risks in the allowance for it to be reasonable and achievable for SESW and other similar companies.

Materiality

24. For small issuers, each issuance represents a more material proportion of the debt book and thus has a more material impact on the overall cost of debt faced by a small issuer. In our case, the cost of debt has historically been driven by a single instrument. [10]

Timing of issuance

25. As an infrequent issuer, SESW has less control over the timing of issuance at benchmark size than larger issuers. We acknowledge that the timing of issuance outside company control for all issuers to some extent as it is constrained by refinancing and capex requirements. However, an infrequent issuer has significantly less control over the timing of issuance at benchmark size as it is additionally constrained by low financing requirements in each year.

26. An issuer like SESW would have to wait and issue short term financing[11] until it accumulates the sufficient financing required to issue at benchmark size[12]. This would be likely to take a long time given the size of its RCV. As a result, SESW is exposed to an increased risk of borrowing during periods where interest rates may be volatile, as we have witnessed recently.

27. Timing of debt issuance can have a material impact on cost of debt where there are step changes in interest rates. This leaves SESW and other small issuers vulnerable to market fluctuations. This includes periods of higher rates post the global financial crisis and also in the current higher interest rate environment we face today The timing of issuance of SESW's debt is largely concentrated in early 2000s which has resulted in a higher weighted average cost of debt relative to companies that issued debt in a falling interest rate environment between 2010 – 2021 Moreover, looking towards the future, market fluctuations will be a significant risk in light of the current economic and geopolitical instability.

Debt mix

28. In general, issuers target a stable capital structure over time. This is because volatile gearing, whether exceeding or falling short of the target, could result in changed levels of financial risk and headroom against covenant and credit ratio thresholds.

29. It can equally introduce volatility in returns to equity investors. The latter is not aligned with the objectives of utility company investors, who typically seek stable equity returns over time.

[9] PR24_final_methodology_Appendix_11_Allowed_return.pdf (ofwat.gov.uk), p.88.

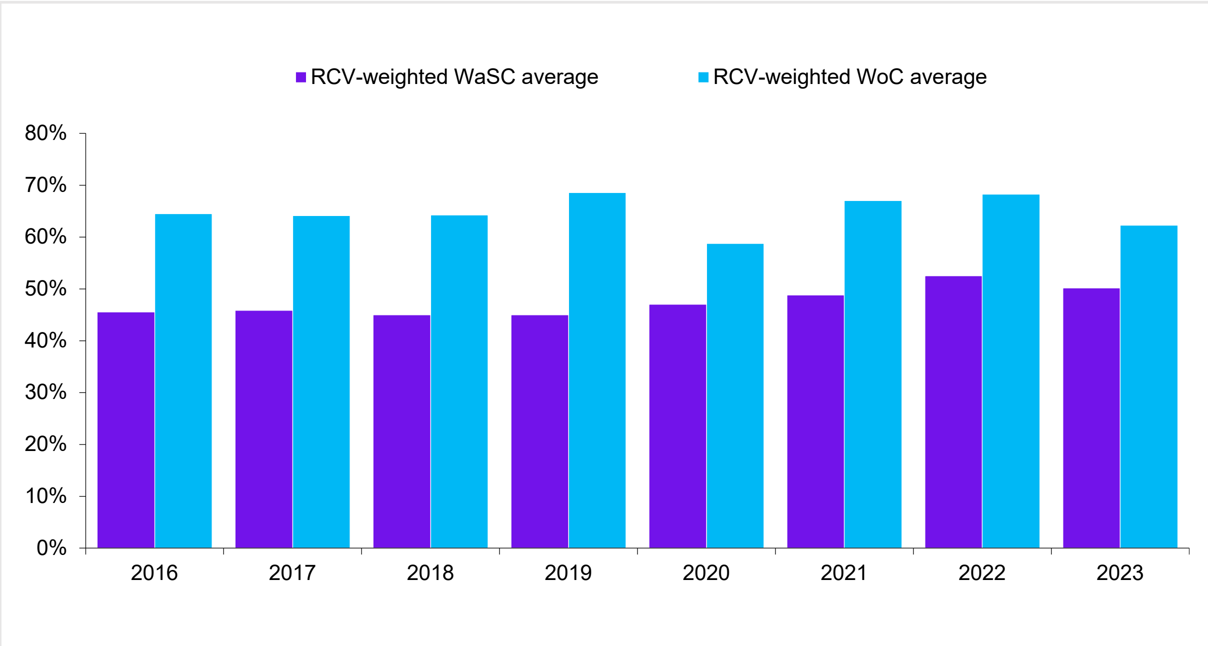
[10] SES current debt book comprises of 1 long term index linked debt (Original issuance - £100m, Current outstanding - £201.3) and 2 full drawn RCF facilities (Facility size - £50m and £25m), which are used to finance the RCV

[11] Short term financing from other non-public and alternative markets, which is more expensive than long term financing (public bonds)

[12] The RCFs are fully drawn and do not impact timing of issuance

30. The combination of (1) debt issuance and maturity and (2) accretion on index-linked debt contributes to the maintenance of stable gearing for most regulated water companies. For infrequent issuers, debt issuing does not occur frequently enough to facilitate the maintenance of stable gearing, so such companies draw more heavily on index-linked debt to better align the sensitivities of assets and liabilities to outturn inflation.
31. As a result, an efficiently financed infrequent issuer is therefore more likely to carry a higher proportion of index-linked debt as this allows for greater stability in the capital structure.
32. This is corroborated by the actual debt mix maintained by water companies. The figure below clearly illustrates that in the UK water sector there is a strong positive correlation between size and the proportion of index-linked debt. Smaller companies (WoCs) exhibit on average a materially higher proportion of index-linked debt than larger companies (WaSCs).

Figure 2: ***Proportion of Index-linked debt in water sector***[13]



Maturity concentration and tenor

33. The CMA recognised as part of PR19 that small infrequent issuers are more likely to raise debt at longer tenors: *"… that smaller scale meant that WOCs were pushed to issue public debt infrequently and at long tenors"*. [14] This is because an infrequent issuer has less scope to spread maturity concentration as each issuance forms a material proportion of the debt book and new instruments are issued infrequently.
34. Raising debt at longer tenors is a key tool for managing short-term refinancing risk. Additionally, it has historically only been possible to issue index-linked debt – which infrequent issuers are more likely to issue – at longer tenors, which exposes the infrequent issuers to additional risks such as limited ability to change financing strategies and manage refinancing risk. Even for sub-benchmark debt from non-traditional sources, infrequent issuers have less flexibility to spread maturity profile and therefore end up with limited ability to manage refinancing risk.

[13] KPMG analysis and data from Ofwat Annual Performance Reports 2016-2023
[14] CMA (2020), PR19 Final Determination, para. 9.1029

E. The relevance and implications of SESW's actual costs for the estimation of the cost of debt allowance for PR24

35. SESW is structurally different from other issuers in the sector: It is one of the smallest companies and one of the most infrequent debt issuers, with significant exposure to market rates dating back to the early 2000s. As a result, SESW has materially different cost of debt outcomes compared to other issuers. Ofwat has traditionally adopted an approach of setting a cost of capital, and cost of debt, on a sectoral wide notional company. This helps ensure incentives are preserved and customers are not exposed to any inefficient costs which may result from a company's choice of particular financing structure or particular costs of debt issuance.

36. However, whilst this approach is in general appropriate it is not necessarily so in the case of a small water company such as SESW for the reasons of the particular characteristics set out above. As a result, careful consideration should be given by Ofwat to incorporating the actual cost of SESW debt when setting allowances, particularly if there is no finding by Ofwat that such debt was inefficient in its issuance or pricing at the point of issuance in the context of its RCV and investment requirements.

F. Regulatory precedent on the treatment of company-specific actual costs in allowance setting

37. Companies whose debt costs are affected by specific characteristics not shared by the rest of the sector are exposed to disproportionate risk of a mismatch between company-specific debt costs and allowances due to factors outside their control.

38. The benchmark provided by the sector average does not accurately reflect the additional costs and risks faced by companies with different characteristics. Therefore, in order to determine an allowance which is appropriate for companies with specific characteristics, additional metrics and factors must be taken into account alongside the sector average.

39. In this context, it is both appropriate and necessary to conduct a cross-check based on the actual costs incurred by companies with the same specific characteristics in order to calibrate a reasonable and achievable allowance. Attaching weight to evidence from actual costs is the only way to effectively ensure that the allowance sufficiently accounts for relevant factors that could give rise to structural differences in cost of debt performance between companies with different characteristics and the rest of the sector.

40. There is regulatory precedent on recognising exceptions to the sector average. Actual costs and yields on a benchmark index are appropriate in cases where specific inherent characteristics of some companies result in structural differences in cost of debt relative to the rest of the sector. In particular:

- In each of its three re-determinations of the cost of debt allowance for BRL, the CC/CMA assigned weight to the actual costs incurred by the company. At PR14 adjusted actual costs were used as a cross-check, whereas at PR19 they were used as a direct input to calibration of a company specific adjustment for BRL[15]. Assigning weight to Bristol Water's actual cost evidence *"reflects the reasonable expectation that investors will, on average, be able to recover their efficiently-incurred financing costs."*

[15] This likely reflects the change in the approach to the sector-wide allowance from primarily index-based to primarily sector-average actual based. In the provisional findings for PR19, where the CMA employed an index-based approach to the sector-wide allowance, it used BRL's actual costs as a cross-check.

- In case of single-company price controls, such as NATS[16] and Heathrow, the actual cost of debt serves as a direct input to the notional allowance for embedded debt. Furthermore, in case of Heathrow, the CAA included a HAL-specific premium of 8bps on both embedded and new debt, reflecting the difference between the spreads at issuance of HAL's Class A bonds and the contemporaneous spreads on benchmark indices[17].
- The allowance for embedded and new debt for the two Northern Irish gas distribution companies (Phoenix Natural Gas and Firmus Energy) is based on the costs of their existing and new instruments, on the basis that these costs are directly observable. [18]

41. Relevance of the Factors Outlined above to the Determination of SESW Cost of Debt
42. The above sets out why, in principle:
    1. Inherent characteristics that are outside company control and that result in a structurally different cost of debt relative to the rest of the sector should be priced in the allowance; and
    2. the evidence from individual company actual costs can be used to both assess the need for and underpin quantification of the required uplift relative to the sector-wide allowance.
43. As SESW is structurally different from other issuers in the sector, the evidence from its actual costs is the only evidence available to adequately benchmark an appropriate allowance for a notional issuer with the same characteristics.
44. To balance the regulatory objectives that:
    1. customers pay no more than an efficient cost of debt and
    2. companies remain able to finance their operations,
45. It is appropriate therefore to assess whether actual costs are commensurate with those that would be expected in terms of an efficient operator, taking into account the characteristics of the issuer.
46. This exercise should be carried out before they are used in the estimation of the allowance.

G. Efficiency of the key drivers of SESW's debt costs

47. The cost of SESW's embedded debt is closely linked to the interest expense on the RPI-linked bond issued in 2001. EY has previously assessed the efficiency of this instrument and concluded that there was no reason to suggest that the bond had been issued inefficiently. [19]
48. Efficiency was assessed with reference to the following factors:

Table 1: Efficiency assessment of SESW's bond issuance

Amount:	SESW had been advised that it would not be possible to issue a bond for a smaller amount. Data on other UK utility bond issuances over the 1999 – 2003 period suggests other utilities did not issue stand-alone bonds of less than £100m.

[16] NATS (En Route) Plc / CAA Regulatory Appeal, Final report
[17] Economic regulation of Heathrow Airport Limited: H7 Final Decision Section 3: Financial issues and implementation
[18] Gas distribution networks price control (GD17) for the period 2017-2022, Utility Regulator. Para 10.47
[19] EY (2017), Funding efficiently incurred embedded debt at PR19

Timing:	At the time of issuance, long term debt was a cheaper source of financing than short-term financing. The decision to raise debt was also influenced by SESW's need to repay its existing intercompany loan.
Tenor:	The 30-year tenor was consistent with that of other bonds issued by utilities around the same time.
Pricing:	Headline coupon of 2.874% and effective all-in cost of 3.8% (taking into account transaction costs and amortisation) were lower than: Coupons achieved on long-dated index-linked bonds issued by other UK utilities over the 1999 – 2003 period (3.4 – 3.8% real, excluding transaction costs). 4.9% cost that the Competition Commission considered SESW might achieve if it continued to use short-term financing, as noted in its PR99 final determination for SESW. 4.0% cost that the Competition Commission considered SESW might achieve if SESW were able to issue a 20-year bond, as noted in its PR99 final determination for SESW.
Index linking:	Issuance of an index-linked bond was consistent with the inflation-linked nature of the regulatory regime. Issuing RPI-linked debt could, given the RPI-linked revenue stream, reduce risks for investors. Many other utilities have subsequently issued index-linked bonds.

49. All of the above suggests that the debt issued by SESW in 2001 was efficient in terms of size of issuance, timing of issuance, pricing and tenor. SESW's efficiently incurred actual cost of debt is a key input into the calibration of the allowance s as there are no directly relevant benchmarks available from the sector that sufficiently closely reflect SESW's inherent characteristics and the impact of uncontrollable factors on its outturn financing position.

H. Implications of projected embedded debt costs for the calibration of the allowance

50. We have assessed the gap between:

    1. Our projected embedded debt costs and
    2. the 'early view' allowance for embedded debt from the final methodology, updated for market data available as at June 2023. [20] [21]

[20] The Model has three categories of inputs that would require updates to reflect the latest market data: (1) refinancing assumption for fixed and index linked debt; (2) inflation assumptions used for accretion up to the end of AMP7; and (3) the calculation of the floating rate adjustment. The assumptions have been updated in the following manner:
– The refinancing assumption in cell C7 of <Inputs> has been updated based on the June average of the yields on A/BBB non-financials index less the 15bps benchmark index adjustment. The rates were sourced from Refinitiv Datastream.
– The CPI and RPI values that feed into the calculation of compound inflation used for accretion of index linked instruments until the end of AMP7 in cells C14-E15 of <Inputs> have been updated based on March 2023 forecasts from the Office of Budget Responsibility.
– The floating rate adjustment calculation has been updated based on base rate and SONIA rates from June 2023 and reflected in column CG of <Mastertab>. The rates were sourced from Refinitiv Datastream.
[21] The Model has three categories of inputs that would require updates to reflect the latest market data: (1) refinancing assumption for fixed and index linked debt; (2) inflation assumptions used for accretion up to the end of AMP7; and (3) the calculation of the floating rate adjustment. The assumptions have been updated in the following manner:
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51. For comparability with Ofwat's estimates we have used the same methodologies for deriving the market assumptions as in the Balance Sheet Cost of Debt Model, such as the pricing of new debt in AMP7. Our assessment of the gap is based on a comparison of all-in embedded debt costs, i.e. issuance costs are included in both the allowance and the projected cost of debt.

52. Our analysis suggests that the all-in cost of embedded debt could be up to 150bps[22] above the allowance based on the sector average. This gap significantly exceeds the 30bps company-specific adjustment proposed in the final methodology. The scale and extent of the differential, when combined with the assessment that the debt issued by us in 2001 was efficient, suggests that the allowance may be mis-calibrated and does not sufficiently price the additional risks that a notional company like SESW is exposed to due to factors outside its control.

53. This gap arises not because SESW issued debt inefficiently relative to market rates but because, due to its inherent characteristics: it happened to:

    1. issue significant proportions of its portfolio when rates were high in early 2000s and
    2. has not issued any long-term debt since.

54. In contrast, larger issuers in the sector – upon whose cost of debt the allowance is based – have issued debt more frequently and have a more comparable exposure to the market rates from different periods with both high and low interest rates.

55. SESW's small size, infrequent debt issuing and the fact that it issued significant proportions of its portfolio in the early 2000s when interest rates were high, has a significant and inherent impact on the cost of debt outcomes. As a result of these factors, SESW is differentiated from other issuers in the sector This should be reflected in Ofwat's approach. Regulatory allowances should be supported by a robust analysis demonstrating that they promote economically efficient market outcomes, are targeted, effective; and do not create distortions and perverse incentives.

56. We have therefore evaluated an approach based on remunerating SESW's actual costs of debt against these key regulatory principles and criteria.

Table 2: Key regulatory principles and assessment

Criterion	Assessment
Does the approach appropriately reflect the degree of control that the issuer has over the underlying drivers of cost of debt performance?	**Yes** Small, infrequent issuers have more limited controllability and greater impact from the factors outside their control which impact on cost of debt performance. This is particularly acute for SESW given its size. An approach which remunerates actual costs would appropriately recognise and price that the degree of

– The CPI and RPI values that feed into the calculation of compound inflation used for accretion of index linked instruments until the end of AMP7 in cells C14-E15 of <Inputs> have been updated based on March 2023 forecasts from the Office of Budget Responsibility.
– The floating rate adjustment calculation has been updated based on base rate and SONIA rates from June 2023 and reflected in column CG of <Mastertab>. The rates were sourced from Refinitiv Datastream.

[22] Our analysis builds on the analysis in the Ofwat Balance Sheet Cost of Debt Model as follows:
a) To facilitate estimation of all-in costs, it incorporates SESW-specific fees associated with bond issuance
b) It includes the expected RCF balance in the modelling to accurately capture the cost of RCV financing given that the facility is used to finance the RCV,
c) It includes the impact of future issuance in AMP 7 using pricing assumptions consistent with Ofwat Balance Sheet Cost of Debt Model

Criterion	Assessment
	control that SESW has is structurally more limited than for other issuers.
Does the approach promote competition with regards to procurement of infrastructural assets?	**Yes** Where infrastructure is procured on a competitive basis, the ability to attract reasonably priced capital is contingent on the availability of long-term stable revenues which price in efficient financing costs. Full recovery of efficient financing costs over the long term would be consistent with competitive market outcomes that regulation is designed to proxy.
Would the approach incentivise debt issuance in a way that is efficient and appropriate for the nature of the assets and the characteristics of the regulatory regime?	**Yes** To incentivise companies to pursue intentional and robust financial decision making, the regulatory approach should reward and penalise companies for performance driven by factors that they can control. To achieve this for a company like SESW, the approach adopted by Ofwat should mitigate the exposures driven by inherent characteristics that are outside our control.
Does the approach effectively address the gap?	**Yes** The approach would address an existing problem with the risk allocation implied in the current regulatory policy on the cost of debt, whereby we are exposed to risk on cost of debt performance due to factors that we have very limited ability to manage.

57. Based on the evidence presented in this annex, we propose that the cost of debt allowance for SESW be based on our actual costs and believe this to be consistent with efficient funding for a company with our RCV and characteristics.

58. Based on our analysis this would imply an uplift of 150bps relative to the allowance based on the median of WaSC and large WoC cost of debt. [23]

59. This estimate may require revision upon the completion of the work commissioned by Water UK to an estimate for the cost of embedded debt based on company business plans, latest market data and 2023 APRs which will be submitted to Ofwat in November.

I. Cost of new debt pricing

60. Whilst Ofwat has provided for an uplift for smaller WoCs in relation to historical embedded debt it has not proposed a similar uplift for new debt despite facing similar characteristics.

61. The analysis of the evolution in the RCV from the latest period indicates that SESW continues to be a sector outlier in terms of the financing requirement implied by the RCV in relation to benchmark size for new debt issuance.

62. Ofgem recognises that the specific characteristics of small, infrequent issuers can result in risk differentials relative to large, frequent issuers.

[23] This is based on debt information from 2022 APRs and market data up to June 2023.

63. Ofgem's pricing of the infrequent issuer premium is based on a premium of 26bps on the cost of new debt which assumes the use of Constant Maturity Swaps (CMS) [24] to hedge interest rate risk from less frequent issuance. The 6bps premium for infrequent issuance is calculated based on applying the 26bps adjustment to the proportion of new debt estimated to be issued across ED2 (22%) at the industry level. Ofgem made this adjustment on the basis of the inability of small issuers to fully match the cost of debt allowance.

64. We believe, Ofgem's approach at RIIO-2 provides a helpful initial basis for pricing the required uplift for new debt. However, to appropriately estimate the uplift on cost of new debt for infrequent issuers in water sector using the Ofgem approach, further analysis is required based on latest market data (26bps uplift is from 2020) ahead of the Draft Determination.

65. But CMS does not perfectly hedge the incremental risks of the infrequent issuer. This is because, for example:

- CMS does not hedge exposure related to the differences in outturn credit spreads[25] and the credit spread assumed in the pricing of the CMS.
- This is recognised by Ofgem.
- CMS does not create a cumulative trailing average of daily yields on the benchmark index as assumed in the cost of new debt allowance implying that the point in time risk remains.
- CMS does not change the ability to control frequency of issuance; as a result, CMS does not appear to change the ability of a company like SESW to match exactly or on a timely basis, the sector's prevailing debt strategy

66. Furthermore, CMS is not a frequently transacted instrument; [26] thus, it may not be practicable to implement hedging using CMS.

67. While the 26bps uplift from Ofgem represents important regulatory precedent for consideration of the uplift to the costs of new debt, we believe Ofwat should also give careful consideration to providing for the actual cost of debt on a forward-looking basis consistent with the market test for the raising debt for a company with our characteristics, particularly where there is no finding or suggestion of inefficiency in its incurrence.

J. Additional cost of borrowing

Issuance and liquidity costs

68. A small, infrequent issuer would be expected to face additional issuance and liquidity costs due to infrequent assess to financial markets and high fixed costs relative to the value of the principal raised. Consistent with this, at PR19 the CMA found that BRL should be awarded 5bps of additional allowance on new debt specifically for *"issuance and liquidity cost allowance, reflecting that average fees may be larger as a result of smaller companies having fewer interactions with financial markets"* [27].

69. The CMA precedent provides an initial estimate of the allowance for issuance and liquidity costs (15bps) which we have included in our plan. However, we suggest that further work is required to assess the sufficiency of the issuance and liquidity allowance in general – given that the estimate has not been updated since PR14 – and for smaller

[24] CMS allow the issuer to swap (receive) fixed iBoxx and pay a rate that is reset daily based on swap rates to match the duration of the debt issuance.
[25] Ofgem (2022), RIIO-ED2 Draft Determinations – Finance Annex, pg. 156
[26] SGN (2020), GD2 DD Response, Section D: Ensuring efficient financing, pg. 198

[27] CMA (2020), PR19 Final Determination, para. 13.49

companies in particular. We note that Water UK has commissioned an analysis of additional borrowing costs for the sector for PR24: this should provide an appropriate starting point for the estimation of the allowance for small companies.

Cost of carry

70. We further note that the final methodology does not include an allowance for cost of carry. Ofwat recognises that companies must certify annually that they have sufficient facilities and resources to finance their activities for the following twelve months. Ofwat also notes that cash from operations and revolving credit facilities allow companies to manage costs of carry and that is has not seen evidence that draws directly on water company accounts to substantiate an uplift.

71. To the extent that floating rate debt is included in the calculation of the sector average debt costs ('all-in' cost approach referred to by Ofwat), it is also appropriate to include a matching adjustment for cost of carry. This is because where floating rate debt is explicitly included in the assessment of actual costs, it is no longer appropriate to assume that the impact of cost of carry and floating rate debt offset one another. Inclusion of cost of carry with floating rate debt is consistent with the approach adopted by CMA at PR19[28] and Ofgem for RIIO2, where Ofgem provided an allowance of 10bps based on network financing and cash on balance sheet[29].

72. We note that analysis of cost of carry will be undertaken as part of the work commissioned by Water UK on additional borrowing costs. We would expect the appropriate allowance for cost of carry to vary in accordance with size and, in particular, depending on the size of the credit facility a company's RCV can support. We suggest that further analysis is undertaken to quantify the appropriate allowance for cost of carry for small companies at the draft determination stage. As a placeholder our plan adopts the 10bps assumption utilised by Ofgem at ED2.

[28] CMA (2021), PR19 FD, paras. 9.607 – 9.608
[29] ED2 FD, Finance Annex, p. 15