SES Water

PR24 Early Cost Adjustment Claim: Pumping Costs for Wholesale Water

9th June 2023

Contents

1. Introduction

We are submitting an early cost adjustment claim for the additional, non-controllable costs associated with SES Water's greater pumping requirement due to our network topography. These are not fully reflected in the base cost models being proposed by Ofwat.

This section provides a brief overview of our claim, its rationale and relevant context. It also highlights where in the claim the reader can find information relevant to each of the cost adjustment claim assessment criteria.

A. Overview

Need for cost adjustment.

1. The topography of the area we serve and the nature of our ground water sources, mean that we have a much greater pumping requirement for abstraction and raw water transport than a typical company within the England and Wales water sector. This higher pumping requirement relative to others in the industry mean that we are required to consume higher volumes of power and are exposed to additional investment and maintenance costs associated with pumping assets.
2. The associated costs are material to us. In the first two years of AMP7 our average annual expenditure on power alone was £6.5m (in 2017/18 prices excluding softening costs which are modelled separately). Recent trends in energy costs have increased this figure. Whilst we do not separately monitor expenditure on pumping energy usage specifically, given the energy-intensive nature of pumping water for abstraction in particular, pumping will account for a high proportion of our total power expenditure in the forthcoming AMP. For example, for the industry as a whole, our analysis suggests that variation in average pumping head (APH) can account for around 55% of variation in wholesale water power costs per distribution input.[1]
3. We are making a cost-adjustment claim to reflect the additional costs we are exposed to due to our network topography. The adjustment would account for additional power costs associated with significantly higher pumping requirements relative to the industry average, as well as associated investment and maintenance costs.

The size and efficiency of our claim.

4. Ofwat's own analysis of base costs in its recent consultation offers an initial insight into the potential size of our claim. A subset of its models include APH, while other models either exclude variables linked to network topography entirely or include an alternative variable (the number of booster pumping stations). We have reviewed the model results including and excluding APH.[2]

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1 See Figure 1 in Section 2 of this Cost Adjustment Claim.
2 For Wholesale Water (WW) and Treated Water Distribution (TWD), this exercise is straightforward. For Water Resources Plus (WRP), since there are no models that include APH, we have had to make some assumptions. At one end of the range, we

5. We draw the following conclusions from this preliminary analysis:
    - The ‘gross’ value of our claim might be expected to fall between £7.9m per annum (based on top-down model results) and £14.4m per annum (based on bottom-up model results) in 2017/18 prices, before accounting for real price trends.
    - The fact that this range sits above our recent aggregate power expenditure indicates that there are potentially significant non-power related costs associated with APH that are not accounted for in Ofwat’s base cost modelling.
6. Our claim is based on detailed analysis; we have not simply used actual expenditure or aggregate model results to assess our claim. However, the figures above represent useful cross-checks on the size of our claim.
7. Ofwat’s analysis of base costs also offers an initial insight into the ‘net’ value of our claim relative to the ‘gross’ value. Implicit allowances will vary significantly from model to model, based on the following features of the explanatory variables Ofwat has used:
    - Where APH is included as an explanatory variable, it is in Treated Water Distribution (TWD) that it is used. This omits an important component of our cost base, i.e. the pumping requirement for abstraction.
    - Ofwat’s alternative explanatory variable in TWD and Wholesale Water (WW) models is the number of booster pumping stations:
        - This has a very weak negative correlation with power costs, and SES has a low number of booster pumping stations. Although intended to account for pumping energy costs, it actually serves to reduce SES’ base cost allowances.
        - As a result, we consider the possibility that implicit allowances in some models are negative.
    - Although Ofwat considers treatment complexity to be a candidate proxy variable for pumping energy costs in the WRP models, the two treatment complexity variables used show very weak correlations with APH and relevant power costs. Given the primary effect of these variables is to control for variation in treatment costs, we expect little to no implicit allowance is made in the WRP models.
8. Given the above, and the detailed methodology we have developed to calculate our early pumping related adjustment claim[3], we estimate that SES Water will need an allowance of £31 million (£6.2 million per annum), in 2022/23 prices, in addition to what is implied within Ofwat’s proposed base cost models, reflecting mitigating actions our management have taken to reduce our exposure. For our final Business Plan submission, we will consider additional actions management can take to reduce our exposure further.
9. In the PR19 final determination, APH was not included within the base econometric cost models. While there was agreement that the inclusion of APH in the cost models had a clear engineering rationale, concerns about data quality prevented its inclusion. As a result, Ofwat agreed with the need for a cost adjustment and provided the allowance we claimed for at Draft Determination (DD) representations in full. We note that since then,

assume that including APH in WRP models would have a similar percentage impact on our efficiency score as in the WW and TWD models. At the other end of the range, we assume that including APH in WRP models would result in a similar overall efficiency score as in the TWD models including APH; this efficiency score is also comparable with our overall efficiency score in the PR19 Final Determination (including successful cost adjustment claims).

3 See Section 2 and 3 for further discussion.

the inclusion of APH as a variable has been reconsidered and in Ofwat's recent PR24 base costs consultation, APH has been included in a subset of the models.

10. In our claim, we provide detail on how the inclusion of APH within the cost models reduces the scope of our required cost adjustment claim for PR24. But we also provide detail on why this is unlikely to fully reflect our cost exposure, particularly as APH, as discussed above, is missing as an explanatory variable for the WRP models and is only included in a subset of the TWD models.
11. We note that the scale of this claim is substantially higher than we had submitted in our PR19 DD representation, even after accounting for headline inflation. We consider this is down to the following factors:
    - **(a)** A change in our approach to calculating our claim to align it with Ofwat's consulted on base cost modelling for PR24.
    - **(b)** Real price increases in power costs, particularly over the past 12-18 months.
    - **(c)** The inclusion within the claim for investment and maintenance costs, which were excluded from our previous submission.

B. Claim structure

12. This claim is structured in line with Ofwat's assessment criteria:
    - Section 2 sets out the need for an adjustment, including: the unique circumstances leading to the requirement; the degree to which management has controlled the need for an adjustment; and our estimate of the required adjustment and its materiality.
    - Section 3 sets out our work to demonstrate that the costs we incur in this area are efficient.
    - Section 4 summarises the arrangements in place to protect customers.

2. Need for adjustment

SES Water's network topography exhibits some unique characteristics that mean we have a higher normalised pumping requirement, both to abstract water and to distribute it to our customers. 85% of the water we supply to our customers is abstracted from groundwater sources in greensand and chalk aquifers located deep underground.

Due to this, our APH is 185m on average for the historical data period, which is among the highest within the industry. In turn, our power consumption, when normalised by the distribution input and by the number of connected properties, is also high relative to the rest of the industry. While we continue to take action to mitigate our exposure to these costs, our network topography and associated pumping requirements are largely outside management control. As such, we require a cost adjustment to ensure our base cost allowance properly reflects our efficient costs.

A. SES Water's unique circumstances

SES Water has relatively unique network topography which necessitates higher pumping.

13. Due to the topography of the area that SES Water abstract water from, we need to pump more than would otherwise be required, to both:

    (a) Transport ground water from its location deep in underground aquifers to the level required for treatment, and

    (b) Distribute treated water from treatment plants to connected properties.

14. This makes our electricity consumption per megalitre of distribution input among the highest in the industry. It also leads to greater investment and maintenance costs due to the greater rate of wear and tear on our pumping assets.

15. The topography of the area we serve means that all of our water abstraction requires some degree of pumping, and often substantial pumping. This is unique to SES Water.

16. We abstract almost 85% of the water we supply from groundwater sources in greensand and chalk aquifers located deep below ground. This is the second highest in the industry and compares with a water company average of 37%. Our remaining abstractions are from a pumped storage reservoir, which also requires significant pumping. Once abstracted and treated, this water is distributed across our region and pumped across the North Downs to customers' homes and businesses.

17. In Table 1 below, we show that over the period 2011-12 to 2021-22, SES Water's APH is the highest within the industry, which translates to the second highest power cost per Ml of distribution input. APH is one of the two variables that determine the power consumption associated with pumping water, the other being the volume of water

pumped, and the power consumption associated with pumping water makes up the majority of electricity consumption within the industry. For example, at SES Water, consumption associated with abstraction, transport and distribution, makes up an average of 75% of our total energy consumption. This is despite there being significant power consumption associated with our legal requirement to soften water.

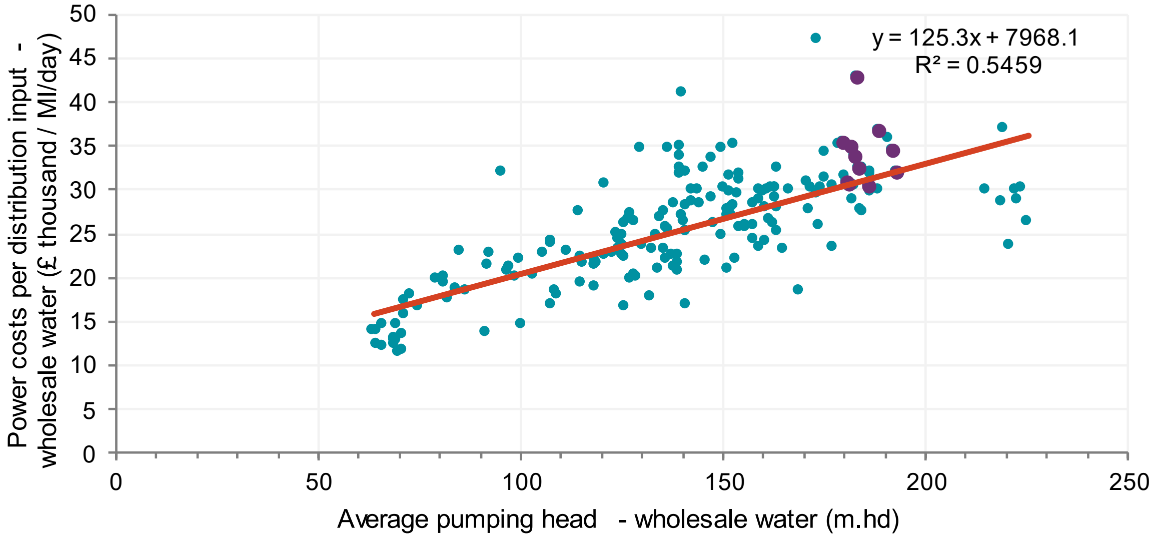
Table 1. Power cost per megalitre of distribution input and average pumping head over the period 2011-12 to 2021-22 (2017/18 prices)

	Wholesale Water – Average Annual			
Company code	**Power Costs / DI (£ / Ml / day)**	**APH (m.hd)**	**Cost Rank**	**APH rank**
AFW	24,613	128	14	15
ANH	28,236	161	9	7
BRL	30,621	183	4	3
DVW	29,089	222	6	1
HDD	36,816	148	1	10
NES	20,257	103	17	17
NWT	17,138	78	19	19
PRT	12,971	67	20	20
SES	**33,932**	**185**	**2**	**2**
SEW	30,723	153	3	8
SRN	26,750	162	11	6
SSC	29,141	179	5	4
SVE	28,793	169	8	5
SVT	25,078	153	12	9
SWB	26,842	134	10	13
SWT	18,178	131	18	14
TMS	22,325	102	15	18
WSH	28,855	141	7	11
WSX	24,942	139	13	12
YKY	22,125	121	16	16

Source: SES Water analysis

18. Looking specifically at water abstraction, Figure 1 shows the correlation between power cost in water resources versus APH in water resources, both are normalised by distribution input in megalitre. SES Water sits at the far upper right end of the distribution.

Figure 1. Correlation between APH & power costs over period 2011-12 to 2021-22



Source: SES Water analysis

19. While we recognise that electricity consumption is to some degree controllable by management, SES Water's high consumption is primarily due to our higher pumping requirements for abstraction and raw water distribution.[4] As a result, SES Water needs to use 46% more energy than the industry average and 91% more than the company with the lowest energy consumption, as shown in the table below.

Table 2. Energy consumption normalised by distribution input over the period 2011-12 to 2021-12, annual averages, MWh / Ml / day (2017/18 prices)

Company	Energy Consumption per Distribution Input (MWh / Ml / day)			Ranking		
	Water Resources	Network Plus	Wholesale Water	Water Resources	Network Plus	Wholesale Water
AFW	33	216	249	15	14	14
ANH	73	248	321	3	7	5
BRL	63	262	325	7	4	4
DVW	42	232	274	13	10	12
HDD	55	294	350	8	2	3
NES	54	149	203	9	19	17
NWT	20	156	176	18	18	19
PRT	72	83	133	4	20	20
SES	**86**	**284**	**370**	**1**	**3**	**1**
SEW	75	225	299	2	12	6
SRN	66	220	285	5	13	7

4 Part of this high electricity consumption is explained by SES Water's additional electricity use for water softening, which is another unique requirement due to statutory duty. We have submitted a separate cost adjustment claim for softening related costs, including the additional costs we incur for power.

Company	Energy Consumption per Distribution Input (MWh / Ml / day)			Ranking		
	Water Resources	Network Plus	Wholesale Water	Water Resources	Network Plus	Wholesale Water
SSC	65	297	362	6	1	2
SVE	37	239	276	14	9	11
SVT	25	253	278	17	5	9
SWB	14	247	266	19	8	13
SWT	9	187	197	20	16	18
TMS	53	156	209	10	17	16
WSH	52	232	283	11	11	8
WSX	28	249	277	16	6	10
YKY	48	192	241	12	15	15

Source: SES Water analysis

20. This finding is replicated when looking at energy consumption per connected property, where SES Water continues to have the highest normalised energy consumption. SES Water needs to use 47% more electricity per connected property than the industry average and 81% more than the company with the lowest electricity consumption.

Table 3. Energy consumption normalised by number of properties over the period 2011-12 to 2021-12, annual averages, MWh/1,000 properties

Company	Energy consumption per 1000 properties (MWh)			Ranking		
	Water Resources	Network Plus	Wholesale Water	Water Resources	Network Plus	Wholesale Water
AFW	21	132	153	14	8	8
ANH	38	129	166	4	11	5
BRL	32	133	165	9	7	6
DVW	21	117	138	13	14	16
HDD	32	171	203	7	1	2
NES	30	83	113	10	18	18
NWT	11	83	94	18	19	19
PRT	39	46	73	3	20	20
SES	48	157	205	1	2	1
SEW	**43**	**128**	**171**	**2**	**12**	**4**
SRN	32	108	140	8	15	14
SSC	34	156	191	6	3	3
SVE	20	126	146	15	13	11
SVT	13	131	144	17	10	12
SWB	8	141	152	19	4	9
SWT	6	132	139	20	9	15
TMS	36	106	143	5	16	13
WSH	30	134	164	11	6	7

Company	Energy consumption per 1000 properties (MWh)			Ranking		
	Water Resources	Network Plus	Wholesale Water	Water Resources	Network Plus	Wholesale Water
WSX	16	136	152	16	5	10
YKY	26	105	132	12	17	17

Source: SES Water analysis

The costs associated with higher pumping requirements are only partially accounted for in Ofwat's proposed top-down cost models.

21. We note that a subset of Ofwat's proposed top-down wholesale water models include treated water distribution APH as a variable. However, we consider that this does not fully account for our exposure to higher pumping costs due to the topography of the area we operate in. The effect of including an APH variable on our efficiency score is most starkly visible in the treated water distribution model estimation results, as shown in the table below. Including the APH variable in place of the number of booster pumping stations improves our efficiency ranking by 12 places across all three variants of the treated water distribution model. **This clearly shows the excluding the APH variable from the base cost models will lead to an allowance that does not fully reflect our costs, given the analysis above shows that power costs are highly correlated with APH (but, as Figure 3 below will show, not with the number of booster pumping stations).**

Table 4. Efficiency ranking under the treated water distribution models

Company code	Company	TWD1	TWD2	TWD3	TWD4	TWD5	TWD6
AFW	Affinity Water	11	14	8	15	17	14
ANH	Anglian Water	17	16	17	13	14	13
BRL	Bristol Water	16	12	15	15	12	17
HDD	Hafren Dyfrdwy	5	6	5	11	13	8
NES	Northumbrian Water	7	5	6	8	9	10
NWT	United Utilities	3	4	2	3	6	5
PRT	Portsmouth Water	2	1	1	6	3	2
SES	**SES Water**	**14**	**15**	**16**	**2**	**3**	**4**
SEW	South East Water	15	12	14	10	6	8
SRN	Southern Water	4	3	4	12	5	11
SSC	South Staffs Water	12	17	13	5	10	3
SVE	Severn Trent Water	6	10	7	3	8	7
SWB	South West Water	1	2	2	1	1	1
TMS	Thames Water	9	8	9	6	2	6
WSH	Dŵr Cymru	10	11	12	14	16	16
WSX	Wessex Water	8	6	11	9	11	12
YKY	Yorkshire Water	13	9	10	17	15	15

Source: Ofwat

APH is excluded from Ofwat's WRP models.

22. Firstly, and most importantly, we note that APH is excluded as a variable in the WRP models. This is the part of the value chain where we are most exposed to higher power costs relative to the rest of the industry, as noted in the previous section.

23. The nature of our water sources means that we have much higher water abstraction APH than others in the industry. As a result, the inclusion of treated water distribution APH within the treated water distribution cost model does not tackle the issue of higher pumping associated with the abstraction and transport of raw water.

24. We note that Ofwat did test the inclusion of APH in the WRP models and found that it was not a significant driver of costs. However, we consider that assuming WRP APH is not a relevant and important cost driver for electricity consumption, would be the incorrect conclusion to draw. This is due to several reasons:

    (a) While on average treated water distribution APH is the largest contributor to wholesale water APH, the other factors also make a significant contribution, particularly at SES Water.[5]

    (b) Our analysis shows that, when normalised by distribution input, there is a strong and significant correlation between APH and power costs. We present this analysis in Figure 6 of the Appendix to this CAC.

    (c) There remains a strong engineering rationale for APH being a driver of WRP costs, regardless of whether this is APH related to water abstraction, water treatment, or water transport.[6]

25. Ofwat has also stated it has some remaining concerns about the quality of APH data across the industry, specifically within the WRP price controls, which has in part driven its decision to exclude APH as a variable in its WRP models. This is not a justification for not accounting for the impact of APH on WRP base costs:

    - It is important to note that SES Water has taken very active steps to improve the quality of our APH data, including ensuring a higher proportion of our APH estimate is derived from measured data. Our 2022/23 APH estimate is associated with a B2 confidence grading, with 34% of the estimate being derived from measured data.
    - We are confident we have improved the accuracy of our data and it would be wholly inappropriate for Ofwat not to account for the impact of APH on WRP base costs for this reason given there is a strong engineering rationale for APH being a driver of WRP costs and strong statistical evidence (see above).
    - Further, f there are indeed concerns of with the quality of APH data of some companies, this is likely to explain the lack of significance found in Ofwat's econometric analysis, as the estimated coefficients are likely to have been subject to attenuation bias.

26. Given the importance of pumping within out water resources cost base, the exclusion of APH has a material effect on the gap between the allowance implied within the base cost models and our actual cost exposure and so requires a cost adjustment.

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5 For example, water resources plus APH contributed 45% of wholesale water APH in 2020-21, compared with an industry average of 40%.

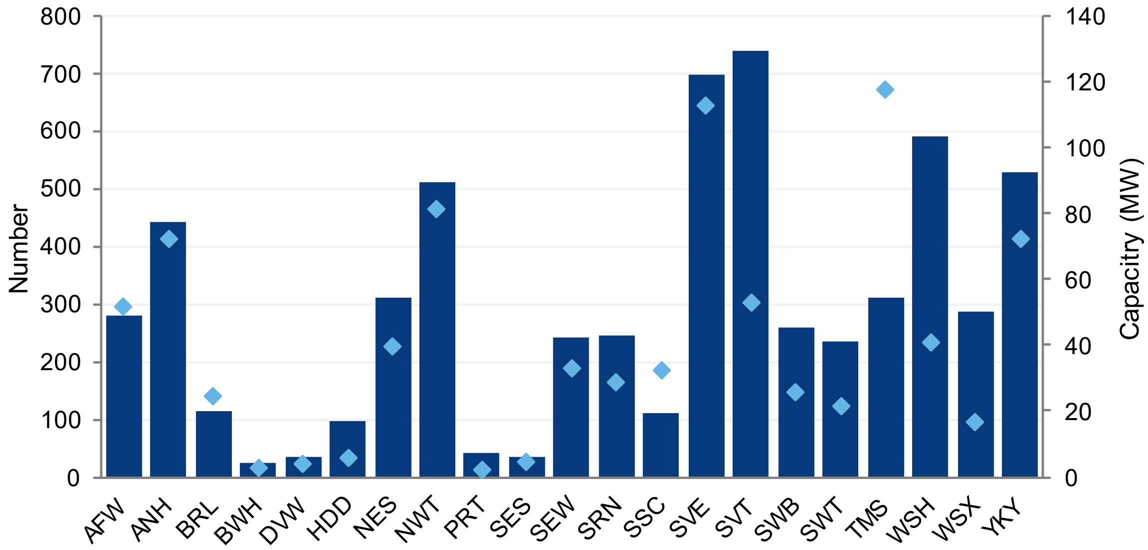
6 More broadly, there remains a strong engineering rationale for the topography of an area and the source of ground water being a driver of costs associated with water abstraction and raw water transport.

The inclusion of the number of booster pumping stations in the base models artificially deflates our costs.

27. 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.

28. 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). As shown in Figure 2 below, there is a relatively random pattern of the relationship between number and capacity of booster pumping stations.

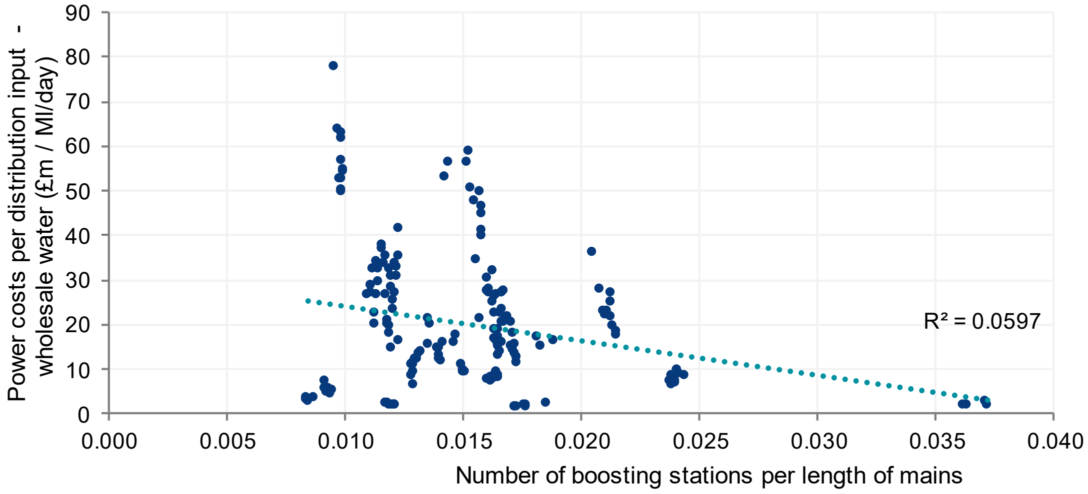
Figure 2. Number and capacity of booster pumping stations over the period 2011-12 to 2021-22, annual averages



Source: SES Water analysis

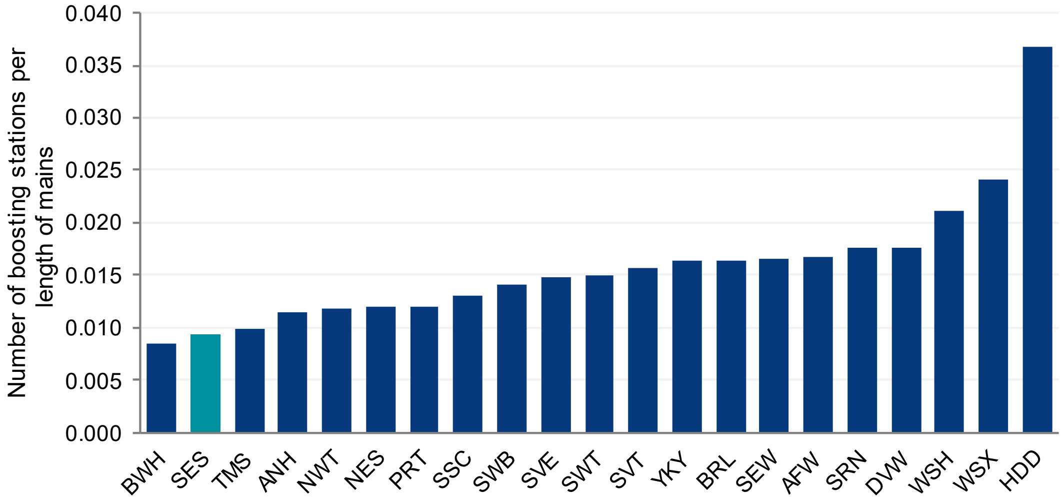
29. As we show in the Figure 3 below, the number of boosting stations per km is negatively correlated with power costs. This makes it an even less convincing driver of power cost related expenditure. For SES Water in particular, the presence of number of boosters per km acts as a negative factor to predict power costs, as we have far fewer booster stations than other water companies (see Figure 4). And as a result, its inclusion 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. Correlation between number of boosters/km and power cost over the period 2011-12 to 2022-23 (2017/18 prices)



Source: SES Water analysis

Figure 4. Average number of booster pumping stations per length of mains over the period 2011-12 to 2022-23



Source: SES Water analysis

B. Controllability

The impact of the topography of the area we serve is largely outside management control. Nevertheless, we have undertaken a set of measures to reduce our cost exposure.

30. In the table below, we summarise the main reasons why our greater exposure to power costs is largely outside of management control. We also summarise the main mitigations we have undertaken where there are factors within management control, that could be used to manage our exposure.

Table 5: Summary of drivers of energy costs and mitigations

Driver of energy costs	Ability of management to control costs / mitigation actions
Type of raw water sources	Our raw water sources are dictated by topography of the area we serve and our historic investment decisions. These have been made by balancing the need for a sustainable supply of raw water with raw water quality, environmental impact, and resilience to extremes of weather. Until our multi-AMP resilience programme, which will enable us to supply all regions of our area from more than one works, is complete, the ability to choose which sources (and hence which works) are utilised is limited.
Volume of water moved	We are developing stretching targets for per capita consumption (PCC) and leakage reduction for our PR24 business plan. We will retain one of the lowest levels of leakage in the sector and aim to bring our PCC down further.
Efficiency of equipment	Our robust operation and maintenance of pumps is essential to their reliability as well as cost of operation. While our power consumption can vary from year to year, we have approximately delivered an 8% improvement in energy efficiency over the past decade, and we propose to deliver further efficiency improvements over AMP8.
Management of unit electricity costs	Electricity costs form a material element of our overall operating expenditure. We run an Energy Strategy Committee (a subcommittee of our main Board) to agree and oversee our electricity procurement activity throughout each AMP. Energy is procured up to – and sometimes in excess of – a year in advance. In Table 6 below, we show that SES Water ranks 6 out of 17 companies in terms of power cost per MWh of consumption in 2021/22. Our unit costs are 13% lower than the industry average, despite our limited bargaining power relative to larger water companies. As a result, we consider we have taken reasonable steps to mitigate our exposure to high power costs by ensuring effective procurement of electricity.

Source: SES Water

Table 6. Power cost per unit of consumption in 2021-22, £/MWh 2017/18 prices

Company	Power unit cost (£/MWh)	Rank
AFW	136	13
ANH	89	4
BRL	88	3
HDD	147	15
NES	153	17
NWT	119	11
PRT	72	2
SES	**97**	**6**
SEW	113	10
SRN	98	7
SSC	58	1
SVE	112	9
SWB	121	12
TMS	148	16
WSH	143	14
WSX	91	5
YKY	109	8

Source: SES Water analysis

C. Calculation of required adjustment

31. To calculate the required adjustment, we have taken the following approach:

(a) We have developed a select number of econometric models to estimate the gross impact of APH on our power costs. Some of these models relate to specific price controls, whereas other models have been estimated at an aggregate level.

We apportion our estimates of the gross impact of APH on power costs into WRP and TWD price controls, in line with the base cost models, and project forwards using the number of properties as the scale variable.

(b) We adjust these estimates to account for increases in electricity prices in real terms over the period 2017/18 to 2022/23. For this we use the Department for Energy Security and Net Zero (DESNZ) non-domestic electricity price index.[7]

(c) We include an allowance for additional investment and maintenance costs. These are based on our own estimates of the relationship between power costs and associated investment and maintenance costs for pumping assets. For this early claim, we assume an 80:20 relationship between power costs and non-power costs associated with pumping. Given recent increases in power costs may have distorted this relationship, we apply the ratio to our estimate of power costs before adjusting for real price increases between 2017/18 and 2022/23. We intend to refine this estimate further as part of our final Business Plan submission.

7 DESNZ (2023) Gas and electricity prices in the non-domestic sector. Available at: https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector

(d) For the treated water distribution model, we include an estimate for the implicit allowance based on the inclusion of the APH variable. We provide further detail on the assumptions underpinning this estimate in the following section.

(e) We intend to subtract further mitigations we propose to undertake to manage our cost exposure. At this stage, the actions we have undertaken are already implicitly captured within our gross claim. For our final Business Plan submission, we will investigate if further mitigations can be subtracted from the gross claim.

(f) Finally, we subtract the power costs associated with water treatment, which are partially captured within our cost adjustment claim for water softening.

32. In the table below, we summarise our calculation steps and the total cost adjustment claim. Our total claim in 2017/18 prices over the full AMP is £26.1 million, or £30.8 million in 2022/23 prices. The breakdown in 2022/23 prices is £15.3m for water resources plus and £15.5m for treated water distribution.

Table 7: Summary of cost adjustment calculation (AMP8), 2017/18 prices

	Water resources plus	Treated water distribution
(a) APH impact on power costs	11.54	9.51
(b) RPE adjustment for power costs [8]	8.02	6.61
(c) Impact on maintenance and investment costs	2.88	2.38
(d) Further management mitigations	0.00	0.00
(e) Implicit allowance for APH in base cost models	0.00	5.38
(f) Exclusion of water treatment costs including water softening	9.47	0.00
Net claim: **(a) + (b) +(c) - (d) - (e) – (f)**	**12.97**	**13.12**

Source: SES Water analysis

33. We have not, for this early submission, adjusted the amounts in Table 7 for catch-up efficiency. There are three reasons. First, given our small size and the significance of this CAC, our overall allowances are particularly sensitive to model selection and the application of this CAC. Second, important elements of this claim are outside our immediate control (in particular electricity unit rates) and so may be less amenable to an efficiency challenge based on aggregate benchmarking. Finally, in the subset of three cost models in which APH is included in a form consistent with the part of the value chain being modelled, our efficiency score is in line with the upper quartile benchmark. Taken together, we do not find convincing evidence that a catch-up efficiency challenge would be warranted. We will, however, keep this position under review ahead of submitting the final claim as part of our Business Plan submission.

8 This adjusts for real price increases between 2017/18 and 2022/23

D. Materiality

34. Looking at the period 2011/12 to 2021/22, power cost accounts for 11% of base costs on average across the industry, while it accounts for almost 15% of base costs at SES Water. Thus provides an illustrative example of the materiality of our claim.

35. In order to match the claim with the Ofwat's requirement, we split our claim into two separate power cost claims, one for water resources, and one for network plus. We then calculate the materiality as the percentage of the claim amount in the totex of the corresponding price control. We use our early view of business plan expenditure in order to calculate the materiality. For water resources, the claim amount accounts for 43% of totex, while for network plus, it is 7%. Therefore, the claim amounts of both price controls are material.

3. Cost efficiency

In this section we set out in further detail the basis on which we have calculated our proposed APH cost adjustment claim and why we consider the claim to be consistent with our efficient costs.

We have developed an approach – which we will continue to review and test ahead of our final Business Plan submission – that utilises econometric modelling to estimate the impact of our additional pumping requirements on our required base cost allowances.

We have also accommodated within our claim, real price increases in our power costs that are not captured in Ofwat's base cost modelling as a result of moving from a real 2017/18 to a 2022/23 price base. We have linked this real price adjustment to an external benchmark index published by DESNZ.[9]

A. Calculation and supporting evidence

1. The additional expenditure we include in this cost claim comprises higher power costs, maintenance (labour and materials) and investment costs (i.e. capital replacement). Additional power costs form the majority of our cost claim, as shown in Table 8.
2. As described in Section 2, we have used econometric analysis to estimate our cost exposure and to forecast our cost claim over the period 2025/26 to 2029/30.
3. Although we have provided a point estimate, the exact size of our cost claim will ultimately be dependent on the final base cost models that are chosen by Ofwat. Specifically, the size of our claim will be dependent on the extent to which APH (both for TWD and for WRP) is captured directly as an explanatory variable within the models. Our point estimate below is based on the base cost models in Ofwat's consultation, assuming an equal weighting of each of the top-down and bottom-up models consistent with Ofwat's guidance for preparing early CACs.

Our gross claim

Estimated impact of APH on power costs

4. To estimate our claim, we have modelled the gross impact of APH on power costs outside of the base cost modelling suite, using five different models. We specifically use power costs (or power costs normalised by distribution input (DI)) as our dependent variables rather than total costs, as we would expect APH to affect power costs directly. As the results of the model show, APH is a significant variable when used to estimate power costs specifically. We have also used multiple models to test the robustness of our

9 A published index that is outside SES Water's control and captures general price increases (over and above CPIH inflation) in energy costs for non-domestic entities in the economy.

findings across a range of model specifications. Our justification for each model is provided in Table 8 below, with the detailed results included in the Appendix.

Table 8. Selected models for power cost adjustment claim

Model	Dependent variable	Explanatory variable	Justification
1	Power WRP/DI	Properties, WRP APH/DI	The value chain matches those Ofwat models that do not have a power cost driver. The unit cost and cost drivers provide strong evidence of APH's impact in driving power cost when normalised by DI.
2	Power WRP/DI	Properties, WRP APH	Same as above, but with total APH for the value chain used instead as a robustness check.
3	Power WR/DI	Properties, WR APH	The value chain that matches the price control, but not modelled by Ofwat. The impact of APH on cost is most significant for SES in this price control. Strong empirical evidence.
4	Power WRP	Properties, WRP APH	The value chain matches those Ofwat models that do not have power cost driver. Use total APH for this part of the value chain for robustness check.
5	Power WW/DI	Properties, WW APH/DI	The value chain matches Ofwat's models. Use APH/DI following strong evidence that APH impact is properly assessed when normalised by DI.

Source: SES Water Analysis
Note: For the dependent variables, we have deflated power costs to 2017/18 prices using the DESNZ electricity price index (Non-Domestic Energy Prices, Table 3.3.2) to better account for real price inflation of power costs.

5. To calculate the gross claim for each price control, we have taken the following steps.
   - Step 1: Run the five econometric models that we use as the basis of our claim to obtain the model coefficients.
   - Step 2: Multiply the coefficients with the corresponding forecast of the explanatory variables, reversing the logarithm transformation, to obtain the model predicted cost.

     Where appropriate, we multiply the cost allowance per Ml of distribution input by distribution input to obtain the total claim.
   - Step 3: For those models that do not match the price control, we apportion the claim based on historical proportions of expenditure.
   - Step 4: Where there are multiple models for a single price control, we average the claim amounts to form a single claim weighting each model equally.
6. The table below provides a summary of the implied claims under each model, including when the model is apportioned to a specific price control. These claims are in 2017/18 prices and exclude the effect of real electricity price increases.

Table 9. Summary results of econometric analysis

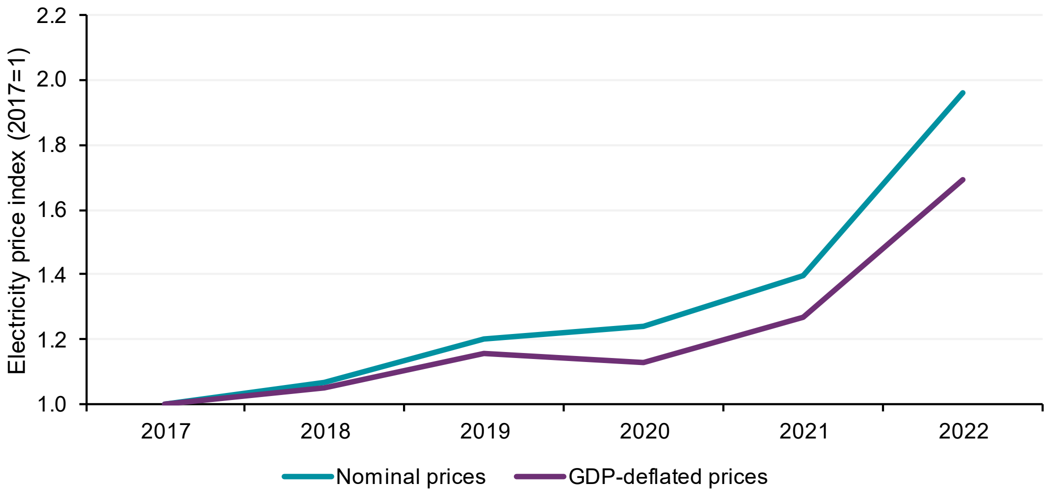
Model	Dependent variable	Dependent variable price control	Raw claim	Apportioned price control	Apportioned claim
1	Power WRP/DI	Water resources plus	11.46	Water resources plus	11.46
2	Power WRP/DI	Water resources plus	11.33	Water resources plus	11.33
3	Power WR/DI	Water resources	3.80	Water resources plus	8.63
4	Power WRP	Water resources plus	11.56	Water resources plus	11.56
5	Power WW/DI	Wholesale water	24.22	Water resources plus	14.71
5	Power WW/DI	Wholesale water	24.22	Treated water distribution	9.51

Source: SES Water Analysis. Detailed regression results shown in Table 10 in the Appendix.

Adjustment to account for real price increases in electricity costs

7. To account for real price increases in electricity costs, we use price indices published by the DESNZ, specifically Table 3.3.2 from the non-domestic energy price series.[10] As can be seen from the data, electricity prices have increased substantially in real terms between 2021 and 2022, by approximately 33%. We have included this in our cost claim due to the specific impact this has on our power costs associated with pumping.

Figure 5. Non-domestic electricity prices, Index 2017=1



Source: SES Water analysis of DESNZ data

10 DESNZ (2023) Gas and electricity prices in the non-domestic sector. Available at: https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector

Estimated impact of APH on investment and maintenance costs

8. To estimate the impact of APH on investment and maintenance costs, we assume an 80:20 ratio between power costs and other costs associated with pumping. This estimate is based on internal analysis of the ratio. We apply this ratio to our power cost estimate before the real price effect adjustment, to avoid distortions from recent real price increases.
9. There are a number of considerations to the expected impact of APH on maintenance costs, including pump configuration - being a combination of capacity of the pump in terms of flowrate and its NPSH/APH - and aspects of maintenance being a fixed cost.
10. We intend to refine our assumptions and provide further supporting evidence, in our final Business Plan submission, but note that the cross checks that we have undertaken for this early cost adjustment claim (see overview section above) would indicate that the overall sizing of the claim can be justified.

Further management mitigations

11. As noted in the previous section, a number of our existing mitigations are included within our base cost submission. However, for our business plan submission, we intend to put forward further mitigations we propose to undertake to manage our cost exposure.

Implicit allowance for APH within Ofwat base cost models

12. We have calculated the implicit cost allowances for each of Ofwat's top-down and bottom-up base cost models by taking the difference of the calculated total allowance under two runs:
    - (a) We first calculate the total allowance using SES Water-specific forecasts of each of the explanatory variables.
    - (b) We then calculate the total allowance using industry average estimates of the two pumping related explanatory variables – booster pumping stations per length and APH for treated water distribution.
13. The implicit allowance varies significantly by model: in models that incorporate APH it is relatively high but for the models that use booster pumping stations as an explanatory variable, we estimate the implicit allowance to be negative. As discussed previously, the inclusion of this variable creates a larger gap between the modelled costs and our actual cost exposure from an engineering fundamentals perspective.
14. When aggregating these implicit allowances to provide a point-estimate, we conservatively assume that there are no negative implicit allowances. Therefore, we have only captured instances where the implicit allowance is zero or positive. This is an element of our approach that we will continue to review ahead of our final Business Plan submission.
15. An implication of our approach is that for the WRP model, we assume there is no implicit allowance within Ofwat's base cost models currently. We consider this appropriate in the context of half the top-down models including booster pumping stations as an explanatory variable, which is negatively correlated with our power consumption, as shown in Figure 3 above. There is also little to no correlation between explanatory variables and either APH or WRP power costs.
16. As a result, our current assumption is that any implicit allowance is being allocated according to scale across the industry. This would imply that SES is indeed getting a

negligible allowance in some of the base cost models. Again, this is an element of our approach we will continue to review ahead of our final Business Plan submission.[11]

Symmetrical cost adjustment

17. We assume the symmetrical cost adjustment will be applied to other water companies based on the inverse of our main explanatory variable – wholesale water average pumping head per distribution input. This incorporates both a scale element (distribution input) as well as a variable linked to the basis of our claim (average pumping head).

11 We considered an approach – consistent with Ofwat guidance - to calculate the implicit allowance where the WRP models were run with and without APH included as an explanatory variable directly in the model. However, since the variable is insignificant in Ofwat's testing, while our disaggregated regressions clearly demonstrate that APH is a statistically significant driver of power related costs, we concluded this was not a viable approach.

4. Customer protection

The consumption of electricity in general is integral to our service delivery. And the pumping requirements we refer to in this submission are at the core of our delivery of water to our customers.

1. Customer protection is achieved through the fact that if the expenditure this claim seeks to secure is cancelled, delayed or reduced in scope, then we would not be able to deliver on a range of our performance commitments that will be set out as part of our PR24 Business Plan, including:
   - (a) Reducing supply interruptions
   - (b) Reducing the risk of unplanned outages at treatment works
   - (c) Via the Retail Cost control, delivering a positive C-MeX score
   - (d) Delivering a positive BR-MeX score
   - (e) Delivering a positive D-MeX score
   - (f) Limiting the occurrence of customer concerns about their water
   - (g) Maintaining industry-leading levels of water quality compliance
2. We consider there to be material reputational damage at stake if these performance commitments are not met, along with significant additional costs to the business. As such, we believe that customers are adequately protected from any risk of the expenditure within the cost adjustment claim not being progressed.

Appendix A Further evidence

Supporting evidence of claims made in this submission.

Figure 6: Correlation between average pumping head and normalised power costs

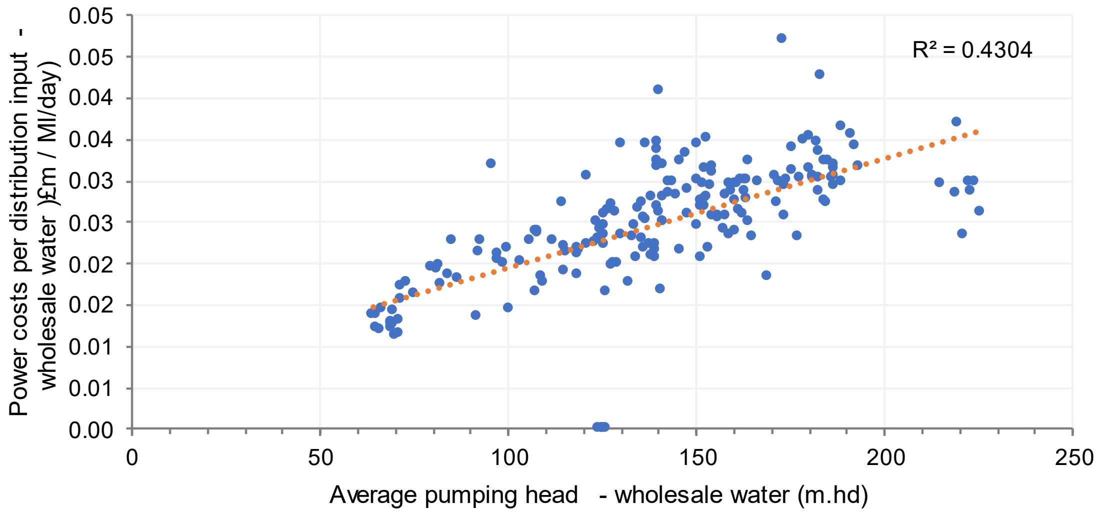


Table 10. Regression result of selected models for cost claim

	WRP/DI	WRP/DI	WR	WRP	WW
lnprop	0.661***	0.144**	1.115***	1.155***	0.644***
	{0.000}	{0.030}	{0.000}	{0.000}	{0.000}
lnaph_wrp_di	0.511***				
	{0.000}				
lnaph_wrp		0.517***		0.498***	
		{0.000}		{0.000}	
lnaph_wr			0.207**		
			{0.049}		
lnaph_ww_di					0.611***
					{0.000}
_cons	-12.260***	-8.371***	-15.141***	-15.949***	-11.729***
	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
depvar	lnrealpowerwrp_di	lnrealpowerwrp_di	lnrealpowerwr	lnrealpowerwrp	lnrealpowerww_di
Est. method	RE	RE	RE	RE	RE
N	187	187	187	187	187
vce	cluster	cluster	cluster	cluster	cluster
R squared	0.303	0.31	0.694	0.884	0.572

Calculation of claim amount

(i) To calculate our net claim, we make the following assumptions:

- The number of properties will grow at the rate equal to the average annual growth during the historical data period;
- APH will be the same as in 2021-22 for the whole forecast period;

- Distribution input will grow at the rate equal to the average annual growth during the historical data period.
- Ofwat will use all 24 consultation models for cost assessment in the final determination, resulting in allowed base cost of £154m for SES and a upper quartile company's efficiency score of 0.99.