12 May 2023

Cost assessment team
Ofwat

BY EMAIL

Dear Ofwat,

Re: Response to consultation on "Econometric base cost models for PR24"

Thank you for the opportunity to respond to this consultation. It is helpful to have sight of Ofwat's thinking on potential cost models for PR24 at this stage to help inform the process and also so that we can test the cost efficiency of our emerging business plan against these models. We hope that you find our suggestions helpful.

As we have set out in our January submission[1] and in the paper we prepared for the future ideas lab[2] we believe that significant collective change is needed from both companies and regulators in order to support a healthier asset base for the long-term. This is likely to require some material change to the way that the efficient cost allowances are set at future price controls and correspondingly the cost models. However, as we have highlighted in the same paper this will be a substantial undertaking that should happen in parallel with other work to establishing and embedding common frameworks for assessing asset management effectiveness in companies and also new and more comprehensive measures of asset health. Given this we still consider that we will need more time to work towards these changes across the sector and perhaps they could be available for PR29. Our comments on the models should be read with this context.

Given the inability to reform the wider cost assessment approach for PR24 we intend to undertake more work on this following the business plan submission and will share any suggestions with Ofwat. We hope that this will be a helpful complement to Ofwat's ongoing work on operational resilience which we continue to support.

As per the first key action in our ideas lab paper, we are also developing investment cases (similar to 'enhancement' cases at the last price review) for additional investment in capital maintenance or asset replacement where we consider there is a clear need for additional investment that cannot be funded from the existing base cost allowances.

[1] NES-PR24-base-cost-modelling-submission.pdf (ofwat.gov.uk)
[2] See: https://www.ofwat.gov.uk/wp-content/uploads/2022/06/Northumbrian_Water_Resilient_efficient_services_require_healthy_assets.pdf

For PR24 we agree with Ofwat that there does not need to be significant change from the PR19 econometric models. Whilst these models are relatively simple, they continue to perform well against statistical performance tests, have good explanatory power and the intuition and engineering logic behind them is sound. This is no doubt why the CMA supported their use in the PR19 appeals and they are also now well understood by the sector having been used previously. We also consider that frequent changes to the models are unhelpful from a regulatory stability point of view as the fundamental engineering and economics of base activities has not changed since PR19.

In the remainder of this document we have responded to Ofwat's consultation questions. The key points that we would draw out are that:

- We support building upon the PR19 models and reconsidering some of the drivers. However, as Ofwat sets out, we think there should be a high-bar to making any changes and only where a variable is demonstrably better than existing drivers should be added.
- We think that some of the new variables introduced do not meet this high-bar test. Consequentially, they are not required and should be removed as the existing cost drivers or other alternatives introduced through the consultation are superior. In particular, we think that the average pumping head (data quality issues) and urban rainfall drivers (poor engineering rationale) are not consistent with the standard required of cost drivers at PR24. We also think that the density and deprivation cost drivers can be simplified. Removing these variables will also rationalise the number of different cost models which have increased significantly since PR19 if left unchanged.
- We support the focus on unit cost models for bioresources as it both gives more intuitive results (diseconomies of scale when considering total costs is not a plausible relationship) and is consistent with the design of the average revenue control.
- For household retail, the allowances should not be setting exclusively using these models. There needs to be consideration inflationary pressures to avoid the situation in this AMP and the previous AMP where the sector has overspent its allowances and current inflationary pressures are amplifying this effect.

If you have any questions about our response, we would be happy to discuss it further with you in more detail. Please contact Geoff Randall at: geoffrey.randall@nwl.co.uk

Best regards,

Northumbrian Water

Cost models for wholesale water activities

Q3.1 Do you agree with our proposed set of wholesale water base cost models?

We think it is helpful that Ofwat is building on the PR19 models and is reconsidering some of the cost drivers.

However, 24 models seems too many and some of the new variables are inferior to existing drivers and alternatives. We therefore suggest these are slimmed down by removing the models including:

- Average pumping head (as explained in the response to Q3.2).
- Weighted average density – LAD from MSOA (as explained in the response to Q3.3).

Q3.2 Do you agree with the inclusion of average pumping head in a sub-set of treated water distribution and wholesale water models? Disagree.

We strongly disagree with the inclusion of APH as a cost driver in the water distribution and wholesale water models. It has a strong engineering rationale but the concerns over data quality from PR19 still persist.

Our position on this is unchanged since PR19 where we agreed with Ofwat and the CMA's determinations to exclude the variable. Whilst some improvements have been made, we do not consider that the evidence has materially changed enough to pass the high bar set by Ofwat for changes to the PR19 models. Booster per km of mains remains a superior alternative and should continue to be used for PR24.

We set out below the reasons for this.

Strong doubts remain of the quality of the average pumping head data

As acknowledged by the Turner and Townsend report: [3]

> *"Ofwat recognises that the availability of robust, consistently reported APH data is key to developing robust econometric models that make fair, consistent determinations for water companies in England and Wales."*

We agree with this statement and it is clear from the evidence that neither robust nor consistent APH data is available despite the best efforts made since PR19.

[3] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 10

There does not seem any methodological improvements in the calculation of APH over time based on the Turner and Townsend report: [4]

> *"All companies that were able to tell us told us their approaches to calculating APH have not fundamentally changed for at least five years, and three for more than 15 years, i.e. their understanding and application of the Ofwat APH formula has not changed. Companies told us that most changes have been driven by tweaks to Ofwat guidance (e.g. price control area boundaries) and changes to the proportions of estimated vs measured data over time, e.g. increased use of telemetry."*

This doesn't suggest that there have been methodological improvements in overall measurement and we know from the report that the level of estimated data used in the calculations remains high.

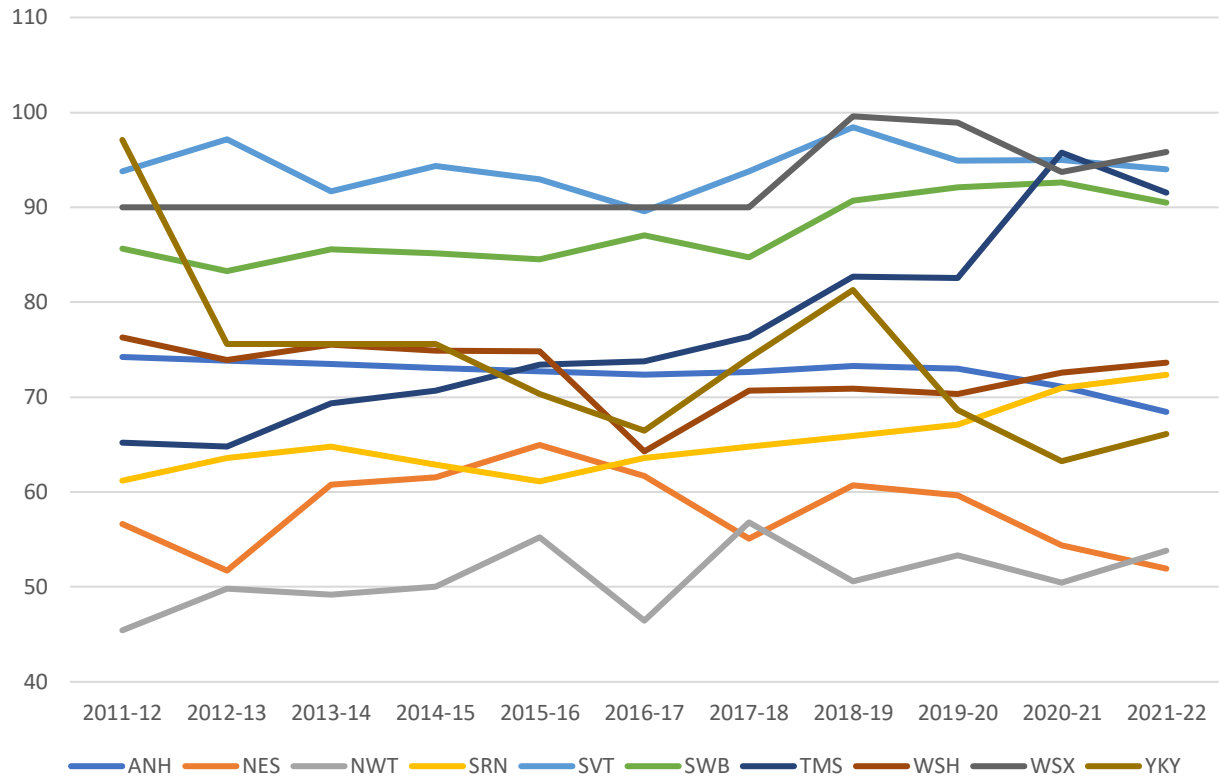
Moreover, whilst companies have made changes to reporting more recently in response to Ofwat guidance, they have not been able to make their historical data more robust. As Turner and Townsend point out:[5]

> *Companies noted that changes to guidance could make it more challenging to carry out historic comparisons or use time series ahead of a Price Review. For some of the clarifications it may be possible for companies to provide historic data but on an updated understanding of the definition.*
>
> *However, where companies have been relying on estimated data and move towards measured data it is unlikely they will be able to accurately back-cast the measured data.*

As a consequence of the above there are still large year on year variations in the data as shown by the chart below.

[4] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 17
[5] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 51

Figure 1: Time series of Average Pumping Head for treated water distribution (WaSCs)



Source: NWL analysis

This shows large movements in APH between years (we assume largely because of guidance changes from the T&T report) which are not a credible representation of the underlying changes in APH over time.

It seems clear from this that a robust time-series for APH is not available for PR24.

The evidence on confidence grades for the data is also very underwhelming with confidence grades ranging from A2 to C3 but even the companies reporting high confidence appear to be using a high level of estimated rather than measured data. Turner and Townsend pointed out that:[6] "one of the companies with the highest proportion of estimated data reports one of the highest confidence grades". This suggests that the confidence grade information at best might be painting an overly optimistic view of the integrity of the data.

[6] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 46

The use of estimated data by companies remains a big problem. Of the 17 companies considered by the Turner and Townsend report in Table ES1 of the report for the treated water distribution component of APH used by Ofwat's proposed models:

- Only 3 companies use only measured data for both volume and lift.
- Three companies used no measured data at all for lift relying exclusively on estimates instead.

This doesn't paint a picture of a robustly calculated variable. Turner and Townsend also point out that:[7] *"Measurement of head is more problematic than flow".* Table 5 in Turner and Townsend report shows estimation methods of each company. For lift, seven companies use pump base plate information or company standard head losses which both rank very low in Turner and Townsend's hierarchy of approaches and most of these companies have a high proportion of estimated data. Turner and Townsend also state that:[8]

> *"Estimated data may be overestimating pumping head (especially if base plate data is being used)."*

This is concerning and could create perverse incentives in measurement approaches.

All of the points above are encapsulated in the Turner and Townsend conclusion that:[9]

> *"there is a wide spectrum of maturity across companies in relation to APH reporting methods and the availability of suitable live measured data"*

This further shows that the data quality concerns from PR19 over APH have not been addressed.

Worsened statistical performance of the models when APH is included

First, APH has not been included in the proposed water resources plus models by Ofwat due to poor model performance – it was not a statistically significant driver of these costs. This is despite the WRP element of APH being 42% of the total APH across the sector according to Turner and Townsend. This corroborates the assessment above on the quality of the data. This should also cast further doubt on the quality of the TWD component which is just the residual of the overall APH calculation.

Second, when APH for TWD is included in the models there is a worsening in the statistical significance of the treat complexity variables in the wholesale models with the complexity variable

[7] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 18
[8] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 46
[9] Turner & Townsend (2023), "Average Pumping Head: data quality improvement", page 7

no longer being significant at the 10% level in model WW10.This may be due to the omission of the WRP element of APH which still drives 42% of overall APH and therefore total wholesale costs.

We do not see how it can be credible to use APH for TWD only. APH is either measured accurately and is a robust cost driver, in which case it would work for both WRP and TWD or it is not. The data seems to show that it is not.

Conclusion

In the 7 September 2021 CAWG working group slides, Ofwat stated that (emphasis added): [10]

> *Companies have encouraged the early release of base cost models at PR24. Therefore,* ***if APH is to be seriously considered as an explanatory variable in the wholesale base cost models at PR24, all data quality issues will need to be resolved before 2021/22 APR submissions.***

As we have demonstrated above and reinforced by the Turner and Townsend report, we do not think the data issues have been resolved and therefore it should not be used for PR24. It is not accurately measure now due to estimation, it is not consistent across companies with different approaches used, and company's own data is not consistent over time due to guidance changes. These issues appear to be insurmountable for PR24. We therefore continue to agree with the CMA that booster per length of main remains a "superior alternative"[11].

Q3.3: Do you agree with our approach to modelling population density? Which of the three explanatory variables do you support?

We think that the 2 density variables with the most merit are:

- **Weighted average density – MSOA**: this measure in our view is superior to the 'LAD from MSOA' alternative. This is because the MSOA version maps population data directly to company boundaries and is therefore will give the most accurate mapping of population to company area. Conversely 'LAD from MSOA' alternative first maps data to local authority boundaries which are subject to change over time and do not necessarily align with company boundaries – this approach loses the detail within the MSOA data unnecessarily and will therefore give an inferior estimate of density.
- **Properties per length of mains**: this measure is more relevant from a water company's perspective as it relates to the operational density of our activity, i.e. how densely

[10] PR24 CAWG Average pumping head, connected properties and ensuring quality data, page 9
[11] Competition and Markets Authority, 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations Provisional findings' (2020), page 142

grouped are customers on our network which will determine our operational challenges and strategies to overcome them. The MSOA data views density from a different perspective over the wider boundary which will include areas where we do not provide any services and therefore will not impact on our operational activities. This variable is also consistent with the PR19 approach on wastewater. This variable provides a useful alternative perspective on density to the MSOA data.

We therefore think that a combination of these 2 variables should be used.

Q3.4: Do you agree we should collect additional data on the number of reservoirs that are designed as high-risk by the Environment Agency and Natural Resources Wales? Do you have a view on the appropriateness of capturing a variable for reservoir inspection and maintenance requirements under the Reservoir Act 1975 in the water resources plus models?"

We do not think collecting additional data on the number of reservoirs designated as high risk by the Environment Agency would be that informative. Most reservoirs were built in raised locations (to benefit from gravity when raw water is extracted) and close/above population centres (to benefit from proximity to demand). We therefore roughly estimate over 90% of reservoirs fall into this high risk category. Given this high proportion we are not sure that the data would be that informative.

In addition, the costs of being designated high-risk are not significant. The additional costs associated with maintaining a reservoir to the requirements of the Reservoirs Act 1975 that is high risk is the need for a 10 yearly inspection by an Inspecting Engineer (S10 Report) and often twice yearly inspection by a Supervising Engineer (S12 Report). For us this expenditure of around £350k per year.

The S10 report sets out requirements for works to be undertaken in a short timeframe (often 3 years from the date of the report) to upgrade the dam in line with best practice / guidance such as improving the capacity to pass through floods without failing. These types of work are called “measures to be undertaken in the interests of safety” and are statutory. Other items which come from a S10 report are for general maintenance such as painting steelwork, maintaining access roads, operating valves etc. These are expected to be undertaken over the next 10 years on a regular basis. There are obviously costs that arise from this but we would need to undertake these works in any event as responsible asset managers – it is therefore not clear that the high risk designation increases costs as it implies that water companies would not undertake this maintenance without it.

We therefore don’t see a need for a variable capturing inspection costs as these are not material. Reservoir maintenance costs are significant and there could be merit in cost drivers that consider the cost of water from different sources but this has already been undertaken by

CEPA who did not recommend these variables with sound reasoning. We therefore are not confident that there is much more to do in this area and suggest effort would be better focused elsewhere.

Cost models for wastewater network plus activities

Q4.1: Do you agree with our proposed set of wastewater network plus base cost models?

Similar to our view on the water models we think it is helpful that Ofwat is building on the PR19 wastewater models and is reconsidering some of the cost drivers.

However, 17 models seems too many and some of the new variables are inferior to existing drivers and alternatives. We therefore suggest these are slimmed down by removing the models including:

- Load treated in STWs > 100k people (as explained in the response to Q4.2).
- Weighted average density – LAD from MSOA (as explained in the response to Q4.3).
- Urban rainfall (as explained in the response to Q4.5).

We think these change would provide a more robust and proportionate assessment of wastewater network plus costs.

Q4.2: Do you agree with our approach to modelling economies of scale at sewage treatment works? Which of the three proposed explanatory variables do you support?

We don't have a strong view on the new variables from a theoretical view – as CEPA conclude there is no strong support for any specific variable from an engineering view. However, the load treated in STWs > 100k people variable does not perform as well statistically where it is not significant at the 10% level. This seems to be the most objective way to rationalise the measures as 3 drivers for economies of scale seems excessive. We'd therefore suggest this variable is removed and the focus for PR24 is put on the load treated in bands 1-3 and weighted average treatment size variables which have good statistical performance and also reduces the complexity by having fewer models.

Q4.3: Do you agree with our approach to modelling population density? Which of the three explanatory variables do you support?

As per our response to Q3.3 we think that the weighted average density – MSOA and properties per length of mains variables should be used for PR24. They provide different outlooks on density and are superior to the LAD from MSO alternative.

Q4.4: Do you agree with our proposal to assume a linear relationship between population density and sewage collection base costs?

We support this position. The squared term of property/length is insignificant in sewage collection models, and it causes the linear term to become insignificant which indicates a less robust model. In addition, as identified by Ofwat in its consultation the economics and engineering of a wastewater system are different from a water system making the squared term less relevant for wastewater.

Q4.5: Do you agree with the inclusion of urban rainfall in our sewage collection and wastewater network plus models?

We strongly disagree with the inclusion of the rainfall variable.

In any network industry, whether it be water, wastewater, rail, electricity, gas etc, the capacity of a system is designed with respect to the peak flows that that it needs to accommodate. In the case of a wastewater system, we design sewers (and their capacity) for at least a 1 in 20 year return period storm. The DWMP includes this as the basis for design and also considers a 1 in 50 year return period, which is Ofwat's common resilience metric for population at risk in a storm (AMP7). The capacity of our system and the associated costs of pumping and maintaining the assets is dependent on the peakiness of flows rather than annual totals. Urban rainfall does not capture this as acknowledged by CEPA in its report for Ofwat:[12] "this variable is unable to capture the "peakiness" of drainage flows".

The rationale included by Ofwat in its consultation for the inclusion of the variable is that:[13]

> *"The greater the volume of inflows into drainage and sewerage networks, the larger network and storage assets need to be, and the greater amount of pumping and capital maintenance costs are needed"*

However, this reasoning does not stack up:

- As set out above, asset sizing and corresponding capital maintenance costs are not driven by annual rainfall totals but instead by "peakiness".

[12] CEPA PR24 Wholesale Base Cost Modelling (2023), page 26
[13] Econometric_base_cost_models_for_PR24_final.pdf (ofwat.gov.uk), page 44

- Pumping costs are already captured by the topography variable used in the sewage collection and wastewater network plus models. This driver measures pumping capacity per sewer length and is therefore a more direct measure of pumping requirements and is therefore better targeted than a total rainfall measure. We'd also expect a strong correlation between pumping capacity and the peak flows that a system is designed to manage so this variable will also be a good proxy for wider asset sizing and capital maintenance costs.

In the absence of strong evidence showing a strong correlation between urban rain and peak flows we do not think this variable has a strong engineering rationale and should not be used. The pumping capacity cost driver already captures some of the costs directly (pumping costs) and would be expected to be a good proxy for capital maintenance costs too.

Even if rainfall were a good proxy for the intended costs, we do not think urban rainfall is the correct measure. This is because is does not capture a number of factors such as:

- Companies with higher proportions of combined sewers (like us) will need to collect and treat more wastewater – this creates a further disjoint between rainfall and costs in the wastewater network plus models.
- The vulnerability of catchments is also a factor – companies (like us) with steep sided valleys funnel flows into our catchments where the soil type is typically clayey which reduces infiltration rates and therefore increases volumes to be collected and treated. This dynamic would not be captured at all in the urban rainfall metric as it assumes that urbanity is the only determinant of flows entering the wastewater system.

For these reasons we do not think the urban rainfall cost driver is fit for purpose and should be excluded from the PR24 cost models.

Q4.6: Do you agree with our approach to capturing sewage treatment complexity in our proposed wastewater network plus base cost models? What are you views on our proposed options to account for additional ongoing cost associated with P-removal?

We agree with the approach to capturing sewage treatment complexity.

Whilst we are required to use a significant amount of UV treatment, the cost driver does not have a statistically significant impact on costs. For the reasons set out the in consultation, it makes sense to retain the PR19 variable related to ammonia consents.

For the options presented on the additional ongoing costs associated with P-removal:

- We agree that it makes sense to continue to consider models with a P-driver as more data becomes available. AMP7 schemes will have a cost impact but the data for these is only just becoming available.
- A post modelling adjustment should also be considered – we would be keen understand how this would operate. This might be preferable or complement the first approach depending on how much data is available from AMP7 when the cost models and
- Cost adjustment claims are the least preferable route to deal with this as it is an area that effects all companies and is best dealt with through a sector-wide solution such as the first two options above.

We would support further industry collaboration with Ofwat in this area.

Q4.7: Do you agree with Southern Water's proposal to include the percentage of population living in coastal areas in sewage treatment models?

We do not agree with the inclusion of this variable.

As identified by Ofwat, the results are entirely dependent on the data for one company (Southern) and the relationship does not hold for the rest of the sector. We therefore agree with CEPA's recommendation to exclude this variable.

Cost models for bioresources activities

Q5.1: Do you agree with our proposed set of bioresources cost models?

Overall we are supportive of the models put forward in the consultation – they capture the key economic and engineering relationships between drivers and costs, and they perform well.

However, as set out in our January 2023 submission on base costs models,[14] we think the facilitation of the market would be best promoted by a greater focus on unit costs exclusively. This would encourage trading between high and low cost companies and promote lower costs overall for the benefit of customers. The proposed PR24 models are still seeking to estimate the efficient costs for an operating area rather than what the efficient costs for a customer should be in a world of sludge trading. The proposals to focus on the unit cost models are a step in the right direction but we think the customer interest would be better promoted through an exclusive focus on unit costs as this is what matters to customers in a market rather than economies of scale or density.

[14] NES-PR24-base-cost-modelling-submission.pdf (ofwat.gov.uk)

Q5.2: Do you agree we should use unit cost models to assess bioresources expenditure?

We strongly agree that the unit costs models are better than the total cost models for the following reasons:

- The total cost models imply diseconomies of scale in the volume of sludge treated. This makes little economic or engineering sense and more likely is a consequence of some larger companies being inefficient which is driving the estimated coefficients for sludge produced above 1.
- None of the density variables are statistically significant. The associated p-values range from 0.19 to 0.64 which suggests poor confidence in the estimation and we consider this fails Ofwat's statistical diagnostic test as outline in Appendix 2 of the consultation.

Due to these reasons we do not think the total cost models are robust in assessing and identifying efficient bioresources expenditure.

By contrast, the unit cost models do not suffer from these shortcomings and have the additional benefit of being consistent with the design of the bioresources average revenue control which also assumes constant returns to scale in sludge produced. There is therefore a clear case for using the unit cost models.

Cost models for residential retail activities

Q6.1: Do you agree with our proposed set of residential retail cost models?

On average companies overspent their 2021-22 retail cost allowances by 15%. This is driven by 14 out of 17 companies spending more than their allowances so it is not an isolated occurrence. We would expect this figure to be larger in 2022-23 as the effects of high inflation kick in on a control that does not have any uplift for CPIH growth. In AMP6, there was a similar finding with 10 out of 17 companies overspending and the whole industry overspent their allowance by £176.46m or 4.25%.[15] The approach to cost assessment at PR19 and PR14 therefore seems to be systematically underfunding efficient retail costs in the sector.

This disconnect between the models and the reality facing companies must be addressed for PR24. At the very least, there must be consideration of company forecast cost data in the business plans that could complement the information obtained from a historical analysis through the cost models presented in the consultation which might allow this disconnect to be bridged. Without this there will be a further unachievable implicit efficiency challenge imposed on water companies through the lack of recognition of inflationary pressures.

[15] Service and delivery report 2019-20 - data

Our comments below on the individual models are therefore prefaced by the statements above. Therefore, while we generally support the changes proposed for PR24 (with the exception of the new deprivation variable which we think is unnecessary) we do not think these models can solely be used to determine efficient residential retail costs for PR24.

Q6.2: Do you agree with our approach to modelling deprivation, and/or have any views on the selected variables?

Overall, we think that 3 variables to capture deprivation is disproportionate (given the difference in costs driven by the alternatives) and that the "high bar" set for changes to the PR19 models is not met in this case. Moreover, the statistical performance of the models including the new variable related to County Court Judgements is worse than those using the PR19 measures. This is because it not statistically significant in 2 out the 3 models using it whereas the PR19 variables are statistically significant in 5 out of 6 models, with the 6th model being a marginal fail at the 10% significance level (p-value of 11%).

We therefore support the retention of the 2 PR19 deprivation variables which have strong economic and statistical support. We do not consider that a 3rd variant is needed and nor would it improve the models themselves.

Q6.3: Do you agree with the inclusion of Covid-19 dummy variables in the residential retail cost models?

We agree with the intent behind the use of the Covid-19 dummy variables in the retail cost models. Without some form of adjustment the large impact on bad debt provisions from Covid would not be accounted for in the models and would affect the estimation of other cost driver relationships. As the modelled costs include debt provisions, the dummies will need to capture both the increase and the decrease in the provisions associated Covid where companies made these. This should be captured by the two year chosen by Ofwat for the dummies but it may be worth checking with companies that this is the case if not already done so.

Q6.4: Do you agree with the removal of transience from the residential retail cost models?

We agree with the removal of the transience variable from the cost models. As stated in the consultation it had very little impact on costs and the data series has been discontinued by the ONS with no obvious alternative available.

Q6.5: Do you agree with the removal of 'proportion of metered customers' from the residential retail cost models?

We agree with the removal of the metered customers cost driver from the models for the reasons set out in the consultation: it performs poorly from a statistical point of view and only has a very small impact on costs with a coefficient close to zero.