Appendix

YKY55_Uncertainty mechanisms and RoRE risk analysis

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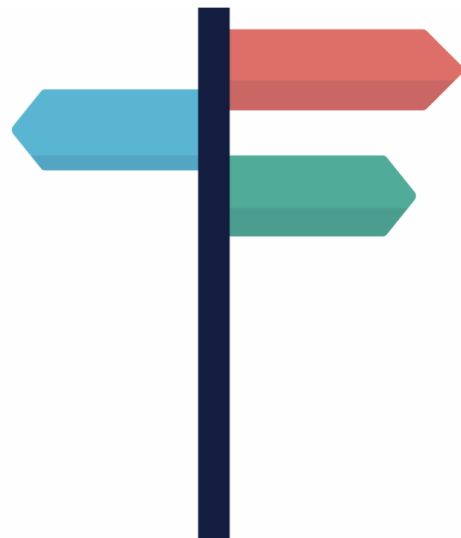This icon can be clicked on to link to any further documents or resources outside of this report

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More detail on this subject can be found in **Chapter 9: Risk and Reward**

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1. Uncertainty Mechanisms

We recognise that several protections already exist in Ofwat's final methodology that limit company exposure to uncertain events. We have completed a thorough assessment of the high level risks of external events through the creation of the plan and have concluded that the majority will be mitigated through existing mechanisms or management action in period.

Our proposals for uncertainty mechanisms are therefore limited to two mechanisms that mitigate excessive downside risk for our plan. We note that these address industry-wide issues so would anticipate any mechanism may also be applicable to the wider industry rather than Yorkshire Water alone.

We set out our proposed mechanisms for input price inflation and bioresources land-bank risk below however we note that these are not specific to YW and would therefore encourage Ofwat to work with the industry to develop a wider consensus on the specifics of these mechanisms.

1.1 Input Price Inflation

We set out in our [RPE Appendix](#) the reasons why we believe it is more appropriate to include an uncertainty mechanism for input prices than to attempt to forecast RPEs going into AMP8. We believe that an input price inflation uncertainty mechanism protects both customers and companies from fluctuations in input prices relative to CPIH.

The below section is lifted from the narrative of our RPE appendix and should be considered in context of the analysis and discussion within that document.

We believe the proposed mechanism from First Economics, a composite inflation index, set out in Table 1.1 below is a good starting point and would help reflect the true input prices and proportions that impact water industry costs.

Table 1.1 A possible PR24 input price inflation true-up mechanism

Input Category	Weight (PR24 industry average TBC)	Proxy Indices
Labour	38%	ONS: Average Weekly earnings index, electricity, gas and water supply (K57Y)
Electricity	10%	BEIS: industrial electricity prices, including CCL
Chemicals	2%	ONS: chemical and chemical products PPI (G6VG)
Materials	20%	BEIS: construction materials price index, All work ONS: machinery and equipment n.e.c. PPI (G5SV)
Other	30%	ONS: CPIH

Source: First Economics Report February 2023. Weights based on PR19 – and should be updated for the industry.

Such an uncertainty mechanism does not add undue complexity to the sector. It is something that is applied across other sectors (e.g. Ofgem's Real Price Effects Model) and once established is a simple, mechanistic approach using independent evidence removing both regulator and company judgment from the process.

Read more about this at **https://www.ofgem.gov.uk/publications/riio-2-annual-iteration-process-2022-transmission-and-electricity-system-operator**

Application of the mechanism as an in-period adjustment to allowances would protect existing customers from paying too much for their bills, and companies from undue RoRE impacts.

We discuss each input category and our initial proposal for an appropriate index below but we would welcome engagement with Ofwat and the industry to ensure the most appropriate index is used.

1.1.1 Labour

it is particularly important that a true-up is maintained for Labour, even if no RPE is applied in the final determination. This will ensure consistency with PR19 and whilst the KPMG report shows that the wedge is not clearly positive over the long term, it is the most material element of company costs and can lag behind CPIH.

Whilst the ASHE index used currently is a broad assessment across all industries and occupations, we feel that the ONS data of Average Weekly earnings index, electricity, gas and water supply (K57Y) will be more reflective of the water industry and could be a more preferable metric to use.

1.1.2 Energy

There is strong evidence of a significant positive and volatile wedge above CPIH in the historical period for Electricity. Without a true-up mechanism companies will continue to absorb increased electricity costs within base allowances (see Figure 1.1 below).

Figure 1.1 Energy costs relative to CPIH and Wedge Analysis
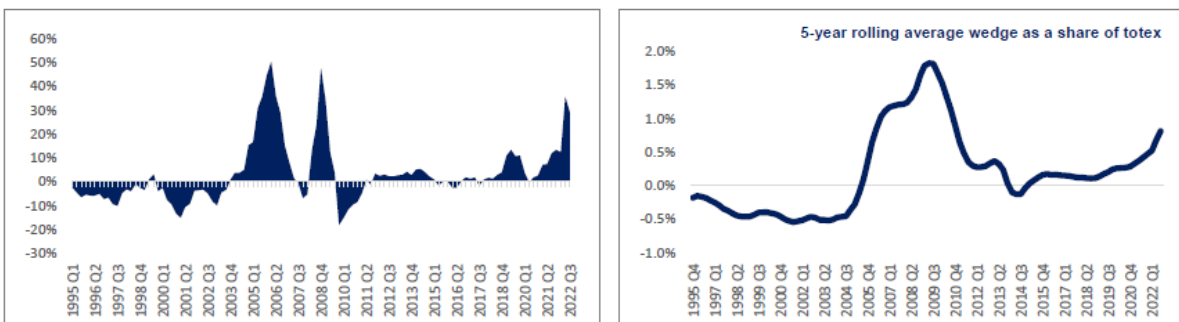
Time period	Wedge	5-year rolling average wedge	Is the wedge significantly different from zero	
Last 28 years (1995-2022)	3.00%	2.2%	Yes	Yes
Last 20 years (2003-2022)	6.70%	4.9%	Yes	Yes
Last 10 year (2013-2022)	5.20%	2.2%	Yes	Yes
Last 5 years (2018-2022)	9.80%	3.4%	Yes	Yes
Last 2 years (2020-2022)	14.80%	4.7%	Yes	Yes
Last 2 quarters (2022, Q2 & Q3)	32.20%	8.2%	Yes	Yes
Last quarter (2022, Q3)	29.00%	9.0%	Yes	Yes

Note: colours indicate **1% significance level**, **5% significance level**, 10% significance level, **lower than 10% significance**
Source: KMPG, ONS, OBR

We recognise that short-term volatility against wholesale price changes can be mitigated in some companies by hedging. However, hedging is not available for non-commodity costs and there will be times where hedged prices are both above and below the market price depending on the timing of contract purchasing. Hedging occurs for companies to increase financial certainty rather than to try to outperform the market.

We believe the use of the BEIS index Industrial Electricity Prices, including CCL is an appropriate measure to index the industry against. It is based on a survey of electricity suppliers on what their industrial customers are paying for their electricity so hedging, insofar as this strategy is utilised across the wider industrial sector will be captured within this metric. We note that a smaller proportion of water company energy costs are related to the cost of gas. This could be separated and trued-up against a separate index, however for simplicity of application and because electricity and gas prices are highly correlated we propose that the electricity price index is applied to the full portion of energy costs.

Read more about this at
https://www.gov.uk/government/statistical-data-sets/industrial-energy-price-indices

Companies will still be incentivised to buy energy at the lowest price possible with this index as it does not insulate companies from wholesale price swings. Companies will still be incentivised to reduce their energy use through Ofwat's Totex sharing mechanism.

1.1.3 Chemicals

A proportion of chemical costs is highly correlated to energy prices given energy is a key input into creating chemicals. We propose that a simple option would be for indexation to a chemicals index such as ONS Chemicals and Chemical Products for Domestic Market

However an alternative could be to identify the proportion of chemicals costs that closely align to energy prices and index these to the energy index discussed previously.

Read more about this at
https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/g6sv/ppi

1.1.4 Materials

An appropriate indexation of materials costs would involve a combination of indices to reflect the different activity that companies deliver. A triangulated index using the below indices

- BEIS: construction materials price index, All work

Read more about this at
https://www.gov.uk/government/statistics/building-materials-and-components-statistics-april-2023

- ONS: machinery and equipment n.e.c. PPI (G5SV)

Read more about this at
https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/ghgv/ppi

Alternatively, datasets are available specific to the water industry from some other independent sources. BCIS https://bcis.co.uk/ have produced a water and sewerage cost index which is used by YW in our capital delivery function.

1.2   Bioresources Reopener

1.2.1   Uncertainty Related to Landbank Availability in Bioresources

There is a likelihood over the coming AMPs that the availability of the landbank for treated sludge will have reduced, if not ceased, meaning the industry will need to invest in alternative recycling or destruction options.

We have already started to see the impact of these changes. Since 2020 the average distance we have had to travel to reach suitable landbank has increased by 29%. This is a result of changes to our operational processes, the "farming rules for water" discussions, and the "20 measures" that were adopted last year and are being written into the BAS Standard.

It is likely the availability of suitable landbank will continue to decrease further, however it is unclear to what extent and when the landbank will be impacted. Landbank availability may vary due to 3 main reasons:

1. Delays caused by a Deployment-Based System

2. Further changes to rules and guidance around applying our product

3. Market acceptability of our products

As well as the above restrictions, there are dozens of smaller risks which we continue to manage but are likely to increase steadily. Any of the above scenarios could materialise and do not necessarily require any change in legislative practice or nutrient guidance.

We describe this risk in more detail in our [Bioresources strategy appendix](#) and in our [WINEP Enhancement case](#) (including the case for SuiAR).

1.2.2   Uncertainty Mechanism – Bioresources Reopener

As discussed above, uncertainty remains in the bioresources price control regarding the industry's ability to recycle to agricultural land during AMP8. There is concern that the amount of land bank available for biosolids will reduce significantly following anticipated legislative changes, reinterpretations of existing legislation or the rejection of biosolids by farmers to their lands in response to shifting public perceptions.

We are mitigating this risk as far as possible with involvement in Water UK industry groups, which aim to provide a national picture to the environmental regulator of the costs and impacts of different applications of the rules, ensuring that it can make the most optimal decisions. We are also exploring alternative disposal routes which may provide more options in the longer term but will not be available for AMP8.

This leads to a risk antithetical to Ofwat's stated policy objectives in Bioresources (namely a more markets-based approach). Companies will not be recovering true costs in the bioresources market and be unable to respond to materially changed circumstances. This could negatively impact the effectiveness of the market and ultimately hurt consumers.

This uncertainty over both the scale and timing of land bank loss and the locations in the country where it could occur means that the costs, timings and best value solutions also remain uncertain. We have identified a worst case scenario (P10) AMP8 cost to Yorkshire Water of £164.3m (a negative RoRE impact of 0.75%). This value is highly uncertain and we believe the introduction of a common reopener limited to the Bioresource price control is the appropriate way to manage this.

We have worked with the industry to develop a proposal for such a mechanism which is set out at a high level below. However the regulations and assessment of the required interventions is extremely complex and needs to be developed collaboratively with Ofwat and the Environment Agency alongside the industry and other companies in the market ahead of final determinations.

Proposal

The proposal has been developed based on an equivalent tool used by Ofgem in the RIIO-ED2 determination[1]. Whilst the drivers were different it provides a framework to work from. We believe a Bioresources Reopener is preferable to and more proportionate than an IDoK.

Triggers – We propose a trigger of a Water and Sewerage company application to Ofwat based on a material increase in bioresources compliance costs due to a reduction in available recycling routes (e.g. recycling to agriculture)

The company would provide independent validation of the relevant 3rd party impacts and would demonstrate it had explored both internal and markets-based approaches to identifying the most efficient way to address the shortfall.

Materiality threshold – A threshold would be agreed linked to the bioresources price control (i.e. % of Totex or Turnover). This could be made to align with the Cost Adjustment Claim threshold or a 10% of bioresources turnover to mirror the IDoK threshold approach.

Ofwat would then have an opportunity to assess the company's evidence and cost efficiency to accept or reject the application. Companies would be required to show the steps they have taken to mitigate and fund the additional expenditure from base through increased efficiency. If Ofwat accepts the application, it would assess the company's case in a similar way as it does for in-period ODIs with a consultation on a draft decision followed by a final decision.

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[1] *Ofgem RIIO-ED2 FD Core Methodology p57*

Notified Item

If Ofwat does not accept a reopener for Bioresources as described, then companies would require a notified item / IDoK to deal with this uncertainty. However, we believe that using an IDoK / Notified Items approach is inappropriate and disproportionate for the following reasons:

a) The IDoK mechanism pre-dates separate price controls and a common re-opener related to bioresources is more in keeping with Ofwat's separate price controls. The regulatory burden of a full reopening on both Ofwat and Companies is likely to be large in the event that a claim is triggered.

b) Ofwat is trying to make a more markets-based approach to Bioresources. The risk of reduced access to landbank would affect the whole market and as in a competitive market, increased compliance costs would be expected to be reflected in prices.

c) This approach is effectively an early trigger in line with Ofwat's adaptive planning approach in the LTDS.

d) There is diminishing RCV protection in bioresources which is unique to the bioresources price control.

e) There is no cost sharing in bioresources, so companies are less protected.

2. RoRE Risk Analysis

2.1 Introduction

This appendix provides details explaining our approach for undertaking the RoRE risk analysis used to populate table RR30. We firstly provide an overview of our approach and overall findings and then provide details of our approach to assessing.

- Wholesale totex risk;

- Retail totex risk;

- ODI risk;

- C-MeX, D-MeX and BR-MeX performance risk;

- Financing risk; and

- Revenue risk;

We then explain the impact of our uncertainty mechanisms and a comparison of our calculated range with Ofwat's indicative range set out in the final methodology.

2.2 Introduction

Further to Ofwat's indicative assessment of its RoRE ranges associated with the PR24 plan we have completed our own assessment of the expected RoRE risk ranges associated with our plan. We continue to recognise that whilst it is imperfect, it can be a useful tool to illustrate the balance of risk in the plan.
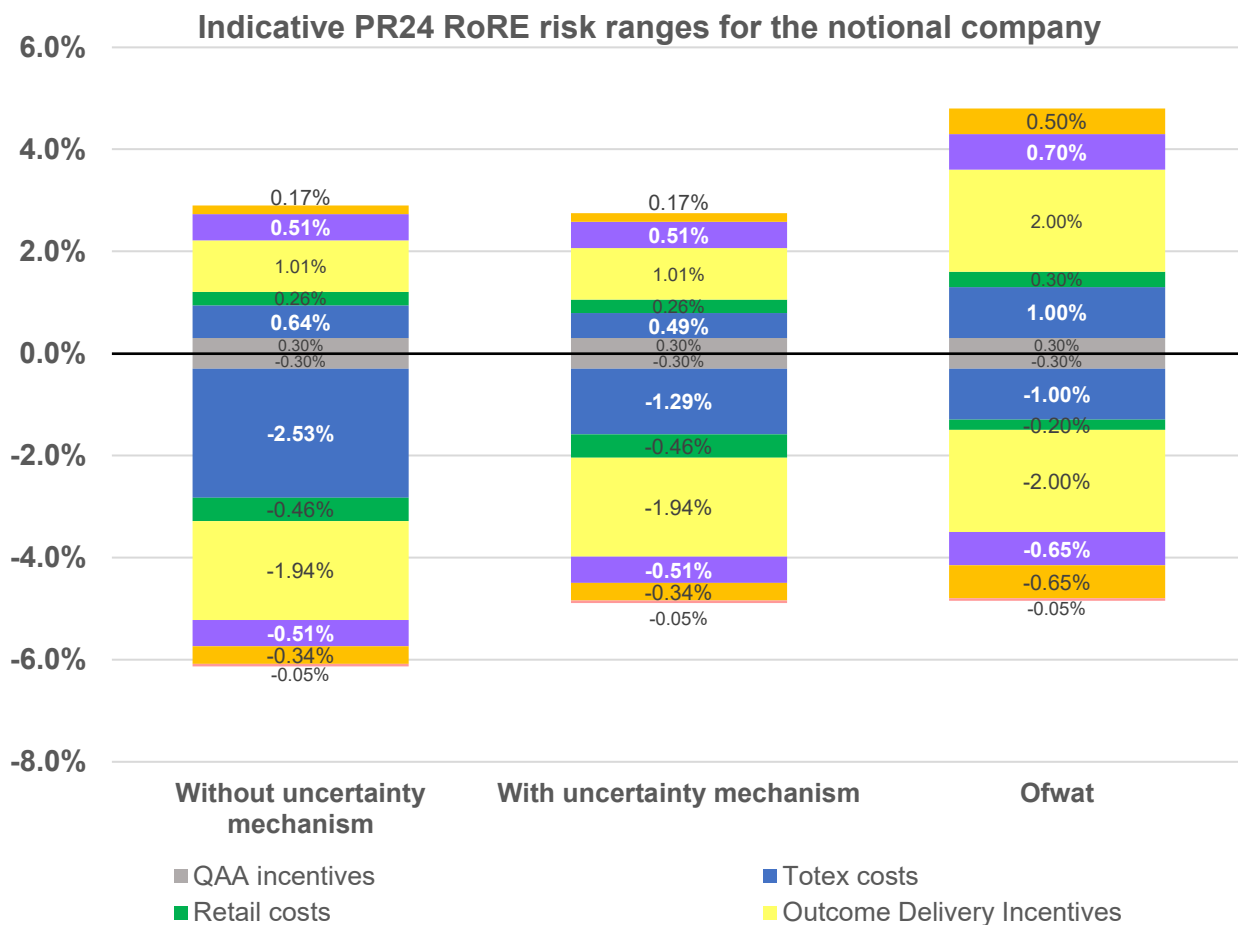
Whilst Ofwat's methodology for companies to complete this assessment is not as prescriptive as in previous periods, we have completed similar analysis to that completed as part of our PR19 submission. We note the following features of our analysis and population of the RR30 data table.

- We have assessed and reported on the risks around our business plan by reference to RoRE analysis for the notional structure. We have considered the scope for upside as well as downside performance.

- The key elements of this assessment have been to bring in data from the 2020-23 period into the indicative assessment that Ofwat used for wholesale and retail totex, and to use recent industry performance data against common PCs to assess the probability distributions to inform our ODI risk. Our approach to modelling ODI risk has been especially detailed, drawing on a Monte Carlo simulation model.

- High and low scenarios are specified in terms of P90 and P10 values at the appointee level (i.e. where risk impacts are shown by price control area, this still reflects 'appointee level' risk, rather than simply summing individual risks, which as Ofwat notes, is inappropriate). All impacts are reported relative to our base case and are in 2022/23 prices.

- Values for 'high case' scenarios are always entered as positive values and reflect outperformance (e.g. in relation to cost scenarios, they capture underspend) – and vice versa for 'low case' scenarios. Where RoRE ranges are reported, these reflect notional gearing, as specified by Ofwat.

- Our RR30 table has been subject to a thorough assurance process.

2.3 Output of Analysis

Our assessment overall associated with the plan we are submitting after factoring in our proposed uncertainty mechanisms is broadly in line with Ofwat's risk on the downside, but we believe the upside is overstated by Ofwat.

Figure 2.1 RoRE Risk Range Analysis Output

Indicative PR24 RoRE risk ranges for the notional company

Legend: QAA incentives (grey), Totex costs (blue), Retail costs (green), Outcome Delivery Incentives (yellow)

2.4 RoRE Component Analysis

The following sections set out our approach to assessing each individual component of RoRE in turn.

2.4.1 Quality and Ambition Assessment

In appendix 12 of Ofwat's final methodology it states that it will cap direct financial rewards at +/- 30 bps on regulatory equity in each year of the 2025-30 price control, and so this is the basis for the range. This range is not asked for in table RR30 and so in our comparative analysis we have set our range for QAA incentives at -0.30% to +0.30%.

2.4.2 Totex Wholesale

Ofwat has developed a risk range for wholesale totex based on the industry performance against cost allowances for 2015-20. This was set out in annex A of Appendix 10 of Ofwat's final methodology and gave an indicative P10/P90 view of around +/- 8.5% for totex over/underspend. Using an assumption of 50/50 sharing rates where cost sharing is applicable leads to a totex RoRE range of between approximately - 1.00% to + 1.00%.

We have used this as a starting point and updated this analysis to reflect the totex over and underperformance seen in the first three years of AMP7 (2020-2023). The industry has undergone some significant financial challenges through inflationary pressures and has invested significantly to achieve stretching PCs in this period. Inclusion of an additional 3 years of data into the totex costs changes the totex over/underspend range to -9.7% to +3.5% for the period 2015-22. Adjusting the totex RoRE range of +/-1.00% accordingly leads to a range of -1.78% to +0.64%. We believe that this appropriately reflects the fact that companies have generally overspent their allowances in recent years.

We considered whether it would be most appropriate to use only the years 2020-23 to reflect the current regulatory regime. However, as the broader econometric modelling approach was introduced at PR14, using the 8-year dataset is appropriate and helps capture a wider range of uncertainty on totex outcomes.

Bioresources risk

In our P10 scenario we include the risk set out in our bioresources appendix and Long-Term Delivery Strategy (LTDS) that the implementation of Farming Rules for Water as well as increasing pressure on farmers to seek alternatives to sludge being applied to their land could lead to a significant reduction in the availability of landbank for sludge disposal.

Our P10 assumption for this is an impact of £164.3m over the 2025-2030 period (22/23 prices) which aligns with the AMP9 cost in our LTDS.

> More detail on this subject can be found in
> **Chapter 5: Long Term Delivery Strategy**

The timing of the impact, the location of the landbank loss and therefore cost of such interventions remain extremely uncertain. With the assumption we have made, and the lack of cost sharing mechanism in the Bioresources price control, this would result in a downside RoRE risk of -0.75%.

We propose a bioresources uncertainty mechanism to mitigate this which is reflected in our overall RoRE risk range.

PCD Risk

The introduction of wide ranging one-sided PCD mechanisms across our enhancement programmes could result in a negative impact on RoRE. Some key concerns around these are summarised below:

- It is rare that we miss regulatory deadlines for our enhancement programmes but given the unprecedented size of the AMP8 programme and the likely competition for resources there is a greater risk than in previous periods. The late delivery mechanism in the PCDs would therefore lead to a downside penalty (although most would not apply until AMP9).

- Overly prescriptive PCDs could lock companies into particular solutions and lead to a lack of opportunity for innovation and a reduction in upside Totex.

- We expect to see a small increase in regulatory compliance costs due to additional reporting burden.

We have not included a PCD downside in our RoRE analysis at this time although will continue to keep this under review. We have tried to set out our PCDs in a way where most of this risk is mitigated. We urge Ofwat to consider, when setting PCDs at draft and final determination, whether any additional downside risk is being introduced into the programmes.

2.4.3 Totex Retail

To calculate the risk range, we have started with the P10 and P90 from the 2015-20 period set out in Annex A of Appendix 10 of Ofwat's final methodology which leads to a range of between -19% underspend and +10% overspend. This leads to a retail RoRE range of between -0.30% and +0.30%.

We then included the data from the most recent years for which we have data, which changes the underspend and overspend range to between -22% and +13% for the period 2015-23. The impact of adding three additional years to the analysis leads to an adjusted range of -0.46% to +0.26%.

2.4.4 Overall Totex

Taking wholesale and retail together, and including the downside bioresources landbank risk (see bioresources risk section above), leads to the following RoRE risk range for totex:

Table 2.1 Overall Totex RoRE Range Ofwat and YW analysis

Totex spend and RORE ranges	Ofwat Approach (2015-16 to 2019-20)		YW approach (2015-16 to 2022-23)	
	P90 (High)	P10 (Low)	P90 (High)	P10 (Low)
Under/overspend (wholesale)	+8.50%	-8.40%	+3.50%	-9.70%
Under/overspend (retail)	+10.0%	-19.0%	+12.9%	-22.3%
RoRE Risk Range (wholesale)	+1.00%	-1.00%	+0.64%	-1.78%
RoRE Risk Range (retail)	+0.30%	-0.20%	+0.26%	-0.46%
Bioresources Land bank Risk	NA	NA	NA	-0.75%
Totex RoRE risk range	**+1.30%**	**-1.20%**	**+0.91%**	**-2.99%**

2.4.5 Outcome Delivery Incentives

A key material element of our PR24 RoRE Risk Analysis is the forecast risk of over / underperformance against the Outcome Delivery Incentives (ODIs) associated with our performance commitments. The below sections sets out our approach to assessing this and how we reached the values set out in RR30.

Approach

We undertook the following steps to get to our assessed ODI RoRE range:

1. review the framework and analytical tools used at PR19,

2. update the approach and modelling tool ensuring consistency with Ofwat's PR24 methodology,

3. evaluate the results to match business knowledge and ambition and

4. Estimate the high and low case (P10/P90) ODI-related financial impacts separately for price controls to be able to populate the RR30 data tables.

Our starting point was to review the framework and analytical tools developed at PR19. In the previous price review, Yorkshire Water had commissioned Economic Insight to provide a comprehensive assessment of the ODI-related performance risk. The results of that analysis are documented in detail within the Appendix 13b from PR19 Business Plan submission.

The result was the development of a robust method for evaluating the ODI-related financial risk which is based on a Monte Carlo simulation model that calculates a range of potential impacts based on a range of probability distributions. The main principles of the methodology were reviewed and found appropriate to continue using in PR24. To achieve better control of the modelling tool and input values, a similar analytical tool based broadly on the existing methodology and, has been developed for the purposes of PR24 built entirely with R programming language.

The range of probability distributions has been updated using the most recent historical performance data at industry-level. For each of the PR24 performance commitments, we have estimated a percentage difference between the actual and the committed performance level using three years of data from 2020 to 2023, as they have been reported in the Annual Performance Reports (APRs) of each company.

We decided to use only the most recent performance data 2020-23 in our analysis. The length of this dataset is limited so it does not give a long-term perspective on factors driving over/under performance. However, we believe this is the only period that appropriately reflects the PC incentive regime we see at PR24. In addition, prior to 2020 we have concerns over data accuracy, quality, and definitions PCs. These have improved in recent years following convergence activity.

Using this dataset has allowed us to obtain an adequate number of data points for each performance commitment and capture the risk associated with each of them. We have also

isolated extreme possibilities from the risk range (such as unrealistically high or low performance levels experienced by water only companies that are not likely to be seen at larger water and sewage companies such as YW).

We grouped these percentage differences by price control to be able to use for the new performance commitments where there is no available historic data.

Figure 2.2 Example distribution developed for total pollution incidents PC
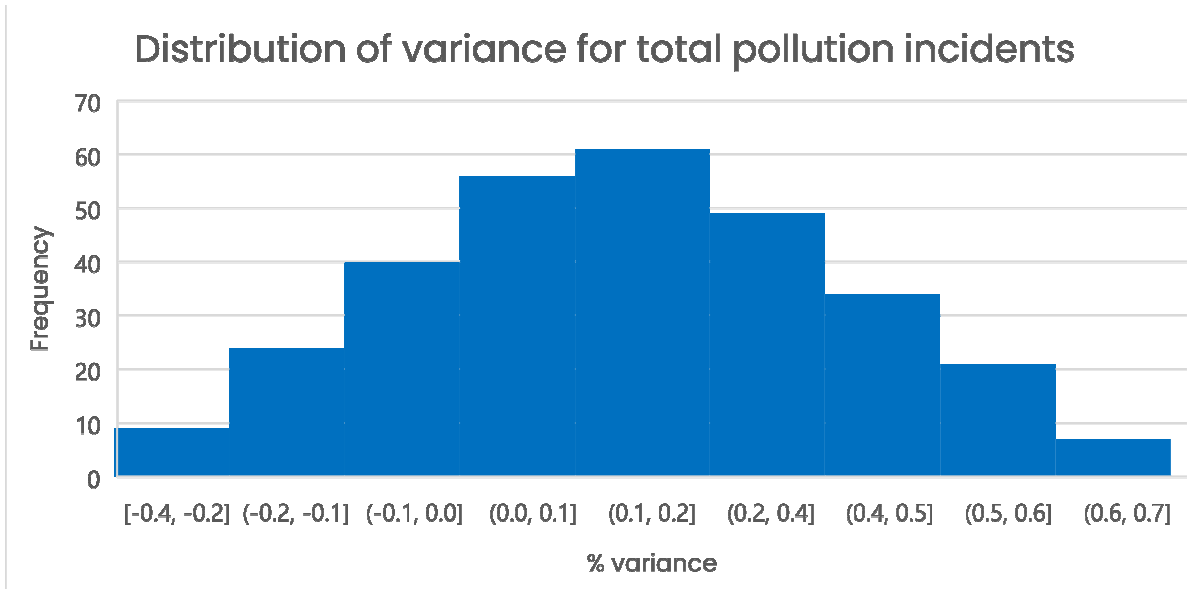
The obtained data points have been used to derive a triangular distribution for each performance commitment or for each price control (See example in Figure 2.2). The triangular distribution requires the minimum, maximum and most likely outcome. It is one of the most widely used types of distributions in a Monte Carlo method. By using the range of probability distributions to estimate the potential ODI-related financial impact we can describe the uncertainty of the performance commitments more realistically. The estimated range of probabilities along with the PR24 incentive rates and performance commitment targets have been used to calculate the range of financial impact in £m. In this way, the performance risk is converted to financial risk for each performance commitment or for each price control.

The key feature of the Monte Carlo/R model is that it iterates and randomly selects values from the large number or possible financial impacts for each performance commitment or for each price control. The summarised range of financial impact is used eventually to estimate the P10/P90 statistical values and to populate the low/high case tables in the RR30 data table.

With this approach the model creates a blend of ODI-related financial payments taking into account the likelihood that the company will simultaneously experience negative and/or positive outcomes. Finally, we created a series of scenarios which considered raw and adjusted probability distributions to reflect the PC package proposed in our plan. Thes scenarios were considered to describe the impact of individual ODIs on the RoRE range and the associated level of uncertainty.

Where relevant, the model considers factors, such as thresholds for enhanced incentive rates, deadbands, caps and collars. The cost sharing mechanism has also been calculated to mitigate exposure to aggregate out/under performance as set out in Ofwat's ODI final methodology.

Results

Following the approach described above, we have used the Monte Carlo/R model to develop a reasonable scenario of ODI risk and used this to populate the RR30 data table. The tables cover high/low risk scenarios split separately for wholesale water and wastewater. The indicative RoRE risk in the final methodology is assumed by Ofwat to be ±1% to ±3% each year for an notional efficient company and Table 2.10 below shows that our analysis is within this range.

The ODI-related financial impact on RoRE is illustrated in the graph below:

Figure 2.3 Annual ODI related financial impact (£m)
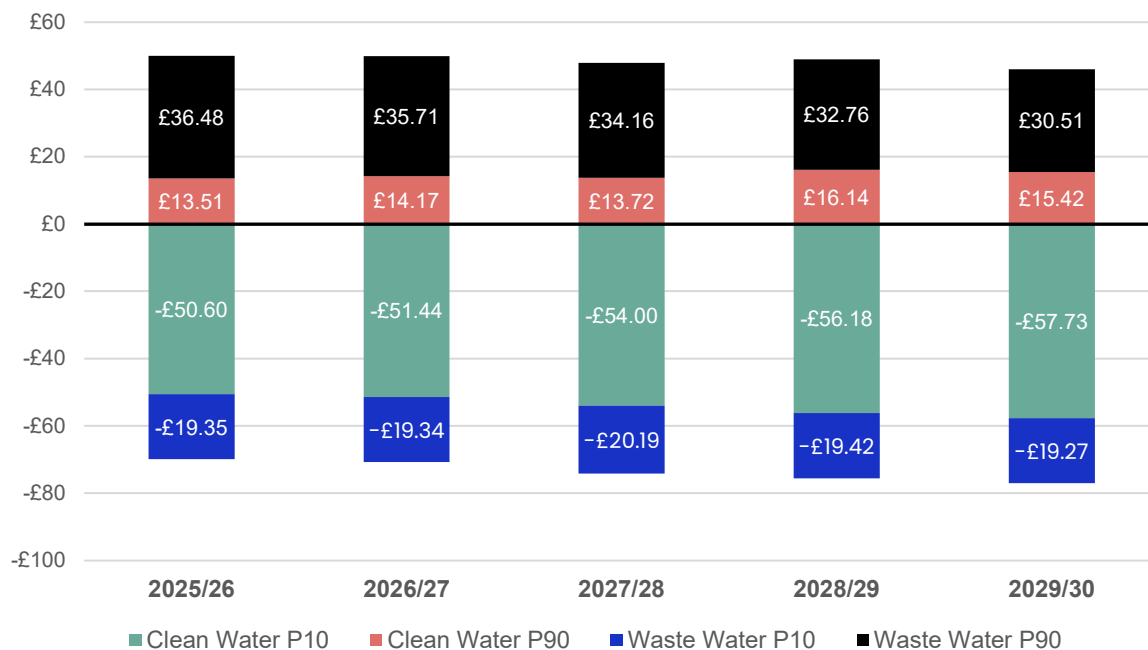
As explained, the P10/P90 values are calculated in the model separately for wholesale water and wastewater. The tables below summarise the results of the selected scenario produced by the Monte Carlo/R model for high and low case respectively.

Table 2.2 Summary of ODI-related impact on RoRE – High case

	Units	2025/26	2026/27	2027/28	2028/29	2029/30	Average
Water ODIs – high case	£m	15.22	16.63	17.11	19.58	19.8	17.66
Wastewater ODIs – high case	£m	28.87	27.91	26.19	25.31	22.84	26.22

Table 2.3 Summary of ODI-related impact on RoRE – Low case

	Units	2025/26	2026/27	2027/28	2028/29	2029/30	Average
Water ODIs – low case	£m	-49.19	-48.88	-51.04	-52.53	-53.78	-51.08
Wastewater ODIs – low case	£m	-31.56	-32.28	-34.07	-34.57	-35.37	-33.57

As seen by the figures above, the model estimates that the ODI-related RoRE impact is –1.94% to +1.01%.

Based on that range, we can conclude that: (i) our approach to estimate the RoRE range for the PR24 ODIs package falls within Ofwat's expected range and (ii) our assessed RoRE range is skewed to the downside. This is an expected outcome given the fact that there are more underperformance payments associated with ODIs and the common performance target levels will continue to be stretching (we have seen very few companies achieve ODI rewards in common PCs in AMP7).

The ODI-related risk analysis has been through quality assurance by developing a model with quality assured input values, documenting model changes, external review by Economic Insight

during development, internal audit of the finalised model, challenge, and review by the company, as well as presenting the scenario outcomes with its rationale to senior management.

2.4.6 Financing Risk

Ofwat defines financing risk as the risk relating to performance against the allowed cost of debt and split this into the following two areas:

- Inflationary impacts; and
- Performance on raising new debt

We agree that these are the two key elements of financing risk and provide further details on our approach to assessing the risk of each of these below.

Inflation risk

We are partially protected from inflation risk due to the indexation of allowed revenues and the RCV; however there remains an element of our performance against the allowed cost of debt that is still subject to some inflation risk.

Debt is priced based on long term inflation expectations, rather than current actual inflation rates, as illustrated by recent market pricing where total nominal yields have not increased in line with the significant increases in actual inflation rates. On this basis our allowed cost of debt is currently set based on a long term inflation assumption of 2%.

In order to assess the level of inflation risk we therefore need to consider the potential fluctuation across the 2025-30 period of this long term inflation assumption. To do this we have analysed daily government liability curve (inflation) data provided by the Bank of England over the last 10 years. Whilst this data is RPI based rather than being CPIH, we consider that it provides a reasonable indicator of the fluctuations in long term inflation expectations over the period.

We considered data between a 10 and 20 year tenor, reflecting the range of tenor typically issued across the sector, across both forward and spot curve data as summarised below:

Table 2.4 Analysis of Bank of England data to inform inflation risk

Inflation - 10 year fwd curve Bank of England GLC data	P10	P90	P50	Avg	Var vs P50		Var vs Avg	
					P10	P90	P10	P90
Last year	3.46	3.94	3.62	3.66	(0.16)	0.32	(0.20)	0.28
Last 3 years	3.51	3.97	3.71	3.71	(0.20)	0.27	(0.21)	0.26
Last 5 years	3.46	3.91	3.66	3.67	(0.20)	0.25	(0.20)	0.25
Last 10 years	3.35	3.84	3.64	3.62	(0.29)	0.21	(0.27)	0.23

Inflation - 20 year fwd curve Bank of England GLC data	P10	P90	P50	Avg	Var vs P50		Var vs Avg	
					P10	P90	P10	P90
Last year	2.85	3.39	3.20	3.17	(0.35)	0.19	(0.32)	0.22
Last 3 years	2.84	3.37	3.16	3.13	(0.32)	0.20	(0.29)	0.23
Last 5 years	2.84	3.61	3.23	3.22	(0.39)	0.38	(0.39)	0.38
Last 10 years	2.95	4.05	3.64	3.58	(0.69)	0.41	(0.63)	0.47

Inflation - 10 year spot curve Bank of England GLC data	P10	P90	P50	Avg	Var vs P50		Var vs Avg	
					P10	P90	P10	P90
Last year	3.20	3.86	3.43	3.47	(0.23)	0.43	(0.27)	0.39
Last 3 years	3.19	4.13	3.51	3.58	(0.32)	0.62	(0.39)	0.55
Last 5 years	3.13	4.02	3.35	3.44	(0.22)	0.67	(0.31)	0.57
Last 10 years	2.73	3.65	3.18	3.22	(0.44)	0.47	(0.48)	0.43

Inflation - 20 year spot curve Bank of England GLC data	P10	P90	P50	Avg	Var vs P50		Var vs Avg	
					P10	P90	P10	P90
Last year	3.39	3.78	3.49	3.54	(0.11)	0.29	(0.15)	0.24
Last 3 years	3.26	3.88	3.54	3.55	(0.28)	0.34	(0.29)	0.32
Last 5 years	3.25	3.81	3.51	3.50	(0.26)	0.30	(0.26)	0.31
Last 10 years	3.23	3.70	3.49	3.48	(0.27)	0.21	(0.25)	0.22

The analysis above indicates potential maximum ranges of +0.43%/-0.48% for the spot curve and +0.47%/-0.63% for the forward curve. Based on this we have considered an inflation risk range of +0.50%/-0.50% to be appropriate.

In line with the assumptions presented within Ofwat's final methodology this results in a RORE range of +0.44%/-0.44%.

Performance on raising new debt

The allowed cost of new debt is subject to an end of period reconciliation, which protects us and customers against variations in the cost of debt across the 2025-30 period. Nonetheless, we will continue to face some risks in this area. Relevant risk factors we have considered include the following:

- **Financing timing risk** – Ofwat's end of period reconciliation relies upon average annual index figures; however the timing of our new debt issuance within each year is dependent upon our capital requirements; therefore we remain exposed to variations between the index at the time of our issuance and the annual average of the index.
- **Financing cost risk** – Whilst Ofwat's end of period reconciliation protects us and customers against movements in the index, we will continue to face financing risk where the cost of any new finance raised is above or below the index. There are two elements to this: (i) inflation risk, which has already been considered above and (ii) whether we are able to raise debt above or below the assumed level.
- **Issuance requirements** – Ofwat's end of period reconciliation applies a standard assumption for the proportion of new debt raised; however the timing of actual capital expenditure and hence issuance of new debt can vary significantly from that originally planned, as illustrated throughout the 2020-25 period.

Financing timing risk

We have assessed the level of timing risk by analysing the index data used by Ofwat across the last six years to determine the variation in the average value of the index each year versus the P10 and P90 values within each year, as summarised within the table below:

Table 2.5 Analysis of index Data to inform finance timing risk

iBoxx A/BBB 10+ data	P10	P90	P50	Avg	Var vs P50		Var vs Avg	
					P10	P90	P10	P90
2017/18	2.88	3.22	3.04	3.04	(0.16)	0.19	(0.16)	0.18
2018/19	3.21	3.50	3.31	3.33	(0.10)	0.19	(0.13)	0.17
2019/20	2.29	3.04	2.56	2.63	(0.27)	0.49	(0.34)	0.41
2020/21	1.90	2.45	2.12	2.16	(0.23)	0.33	(0.27)	0.28
2021/22	2.11	3.03	2.36	2.44	(0.25)	0.68	(0.34)	0.59
2022/23	3.72	5.63	5.02	4.81	(1.31)	0.60	(1.10)	0.81

The analysis above shows that whilst rates were relatively consistent across the first 5 years of data the variance versus the annual average was relatively minor; however when rates have fluctuated significantly, as in the last year, the variance versus the annual average has increased considerably to +0.8%/-1.1%.

The skew to the downside primarily reflects that the market has risen sharply across the last year. If the market were to fall again we would expect the opposite to be true; therefore we consider a symmetrical range to be most appropriate. Based on current fluctuations within the market we have used a range of +1.0%/-1.0% to assess the risk.

We have run the impact of this through Ofwat's cost of debt indexation model which results in a P10/P90 RORE range of +0.15%/-0.15%

Financing cost risk

It has been Ofwat's view that water companies have the ability to issue debt at prices lower than suggested by the chosen benchmark index. However, both the analysis conducted by the CMA as part of the PR19 appeal and the updated analysis conducted by Oxera (see the WACC Assessment appendix) has not found any evidence of material outperformance by companies versus the chosen index – Oxera's analysis shows average outperformance of only 3bp across the 2025-30 period.

On this basis we have not considered the risk sufficiently material to conduct any further analysis.

Issuance requirements

As noted above new debt issuance across the period can vary versus that originally planned due to timing variances in the annual profile in capital expenditure. In order to quantify this risk we have reviewed the profile of our actual capital expenditure versus that allowed across the first three years of the 2020-25 period. In the first two years of the period we underspent our capital cost allowance by c£150m and c£175m respectively and expect to catch this back up in the last two years of the period.

We have run the impact of this through Ofwat's cost of debt indexation model which results in a P10/P90 RORE range of +0.05%/-0.05%.

Conclusion

Reflecting all of the above results in an overall financing risk RORE range of +0.51%/-0.51% as illustrated by the table below:

As debt is not apportioned to individual price controls we have considered financing risk on a total company basis as illustrated above. To determine individual price control RORE ranges we

have allocated the above total risk between the price controls based on the split of RCV, which is consistent with the approach adopted by Ofwat within their PR24 financial model.

Table 2.6 Total financing RoRE risk assessment summary

Cost of debt RORE range	FY26	FY27	FY28	FY29	FY30	Avg
Inflation	-0.31%	-0.31%	-0.31%	-0.31%	-0.31%	-0.31%
Financing timing risk	-0.03%	-0.09%	-0.15%	-0.21%	-0.28%	-0.15%
Issuance requirements	-0.05%	-0.09%	-0.08%	-0.04%	0.00%	-0.05%
Total cost of debt impact	**-0.38%**	**-0.49%**	**-0.54%**	**-0.56%**	**-0.58%**	**-0.51%**

Cost of debt RORE range	FY26	FY27	FY28	FY29	FY30	Avg
Inflation	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%
Financing timing risk	0.03%	0.09%	0.15%	0.21%	0.27%	0.15%
Issuance requirements	0.05%	0.09%	0.08%	0.04%	0.00%	0.05%
Total cost of debt impact	**0.38%**	**0.49%**	**0.54%**	**0.56%**	**0.58%**	**0.51%**

For comparison, Ofwat's indicative range in its final methodology is -0.65% to 0.70%.

2.4.7 Measures of experience (C-MeX, D-MeX and BR-MeX)

Our analysis gives a RoRE range for the measures of experience of +0.17% to -0.34%. For comparison, Ofwat's indicative range is 0.50% to -0.65%.

We have not tried to forecast a P10/P90 range of performance within Ofwat's comparative ODIs for the MeX incentives. We have assumed that our risk range is the maximum outperformance and underperformance position for each PC. The monetary values are therefore based on Ofwat's final methodology indicative approach using a % of the assumed revenues for the period.

For example percentages to our forecasts of revenue for the period 2025-30. For example, for D-MeX we have applied 6% (outperformance payment) and -12% (underperformance payment) to our forecasts of developer services revenue.

We note that the exposure as a monetary value is larger than at PR19 but given our increased RCV due to the large enhancement programmes being delivered in AMP7 the RoRE exposure is less.

The skew of our RoRE range to the downside reflects the larger scale of potential underperformance payments compared with outperformance payments.

2.4.8 Revenue

Due to the materiality of this element of the RoRE risk we have not completed a detailed assessment of the risk to YW and have used the indicative figure in the final methodology of -0.05%. We note that under the proposed RFI mechanism[2] set out in Ofwat's July 23 consultation the proposal to remove the graded penalty mechanism between 2%-3% and replacing it with a flat rate will have a small negative impact on the RoRE range compared to PR19.

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[2] https://www.ofwat.gov.uk/wp-content/uploads/2023/07/RFI_consultation_18_July_2023.pdf

2.4.9 Uncertainty Mechanisms

We are proposing two uncertainty mechanisms alongside our PR24 plan, these relate to Bioresources and Input Prices. As required in RR30 we have assessed the impact on RoRE of each of these which are discussed below.

Bioresources Reopener

As set out in our Wholesale Totex analysis the P10 assumption for an impact of £164.3 over the 2025-2030 period which aligns with the AMP9 cost in our LTDS (LS4a alternative pathway 1 – Line LS41.62). The timing of the impact, the location of the landbank loss and therefore cost of such interventions remain extremely uncertain. With the assumption we have made, and the lack of cost sharing mechanism in the Bioresources price control, this would result in a downside RoRE risk of -0.75%.

We have assumed that the proposed Bioresources Reopener uncertainty mechanism to mitigates this and in the P10 scenario an efficient cost allowance would be granted negating the downside RoRE risk associated with land bank availability.

Input Price Pressure Mechanism

Our proposed mechanism would adjust company cost allowances to reflect changes to input price indices relative to CPIH. We have used historic datasets of the wedge between input prices and CPIH to feed into a Montecarlo analysis that chooses a random point in the distribution of each input price and then weights the output by our SUP11 data table for water and wastewater.

Table 2.7 Normal distribution statistics of input price wedges

	Energy	Labour	Chemicals	Materials
Max	40%	6%	17%	8%
Min	-11%	-4%	-5%	-2%
Mean	6%	1%	1%	1%
SD	0.134	0.023	0.063	0.026

We calculate a P10 and P90 position from the sampled dataset and then divide these values by two to account for cost sharing.

We note that in reality there are relationships between these input prices so our P10/P90 values may be wider than stated in this analysis.

We also recognize that there may be a greater company upside than is reflected in either this or the Totex analysis due to the recent high inflation above CPIH. There potentially is a greater chance of the forward looking CPIH being higher than input prices than in the historic dataset. Whilst this is not reflected in the numbers, this mechanism would remove any additional upside for companies not reflected in this analysis.

We calculate the £m values for inclusion in RR30 by multiplying the Plan Totex by the % cost impact of these input prices. We reverse the signs to reflect the adjustments to allowances that the uncertainty mechanism delivers to reduce the overall RoRE range.

Table 2.8 Input Price Uncertainty Mechanism Adjustment Calculation

	25/26	26/27	27/28	28/29	29/30
Water Plan Totex £m	712.251	667.223	664.910	629.543	604.567
P90 £m	3.405	3.189	3.178	3.009	2.890

P10 £m	-10.347	-9.693	-9.659	-9.145	-8.783
	25/26	**26/27**	**27/28**	**28/29**	**29/30**
Waste Water Plan Totex £m	634.973	826.783	889.583	892.422	723.244
P90 £m	2.983	3.884	4.179	4.192	3.397
P10 £m	-10.139	-13.201	-14.204	-14.249	-11.548
Uncertainty Mechanism Adjustment	25/26	26/27	27/28	28/29	29/30
P90 £m	6.387	7.073	7.357	7.201	6.287
P10 £m	-20.485	-22.894	-23.863	-23.395	-20.331

This leads to a reduction of the low scenario risk by 0.49% of RoRE and a reduction to the upside of 0.15% of RoRE.

Our overall costs are then included in the RR30 table as follows:

Table 2.9 Overall Uncertainty Mechanism P10/P90 Calculation

	25/26	**26/27**	**27/28**	**28/29**	**29/30**
Bioresources Mechanism – High Case (£m)	0.000	0.000	0.000	0.000	0.000
Input Price Pressure – High Case (£m)	-6.387	-7.073	-7.357	-7.201	-6.287
Uncertainty Mechanism - High Case (£m)	**-6.387**	**-7.073**	**-7.357**	**-7.201**	**-6.287**
Bioresources Mechanism – Low Case (£m)	32.860	32.860	32.860	32.860	32.860
Input Price Pressure – Low Case (£m)	20.485	22.894	23.863	23.395	20.331
Uncertainty Mechanism - Low Case (£m)	**53.345**	**55.754**	**56.723**	**56.255**	**53.191**

2.4.10 Overall Output

The overall output of our analysis identifies a RoRE range of +2.20% to -4.07% after the implementation of uncertainty mechanisms. This is broadly aligned to Ofwat's range but it reflects our view that both the PR19 and PR24 framework are skewed to the downside.

We note that this is the RoRE range associated with the overall package/plan we have submitted. Adjustments any elements of our plan that impact the components that make up the RoRE analysis have the potential to change the balance of the incentive package.

Table 2.10 Overall RoRE Range Analysis Comparison

	Without uncertainty mechanism		With uncertainty mechanism		Ofwat	
	Low case	**High case**	**Low case**	**High case**	**Low case**	**High case**
Measures of experience	-0.34%	0.17%	-0.34%	0.17%	-0.7%	0.5%
Financing	-0.51%	0.51%	-0.51%	0.51%	-0.7%	0.7%
Outcome Delivery Incentives	-1.94%	1.01%	-1.94%	1.01%	-2.0%	2.0%
Retail costs	-0.46%	0.26%	-0.46%	0.26%	-0.2%	0.3%
Totex costs	-2.53%	0.64%	-1.29%	0.49%	-1.0%	1.0%
QAA incentives	-0.30%	0.30%	-0.30%	0.30%	-0.3%	0.3%
Revenue incentive mechanisms	-0.05%	0.00%	-0.05%	0.00%	-0.1%	0.0%
TOTAL	**-6.13%**	**2.90%**	**-4.89%**	**2.75%**	**-4.85%**	**4.80%**

Figure 2.4 Summary of YW Indicative RoRE Risk Range

Indicative PR24 RoRE risk ranges for the notional company

Legend:
- ■ QAA incentives
- ■ Totex costs
- ■ Retail costs
- ■ Outcome Delivery Incentives
- ■ Financing
- ■ Measures of experience
- ■ Revenue incentive mechanisms