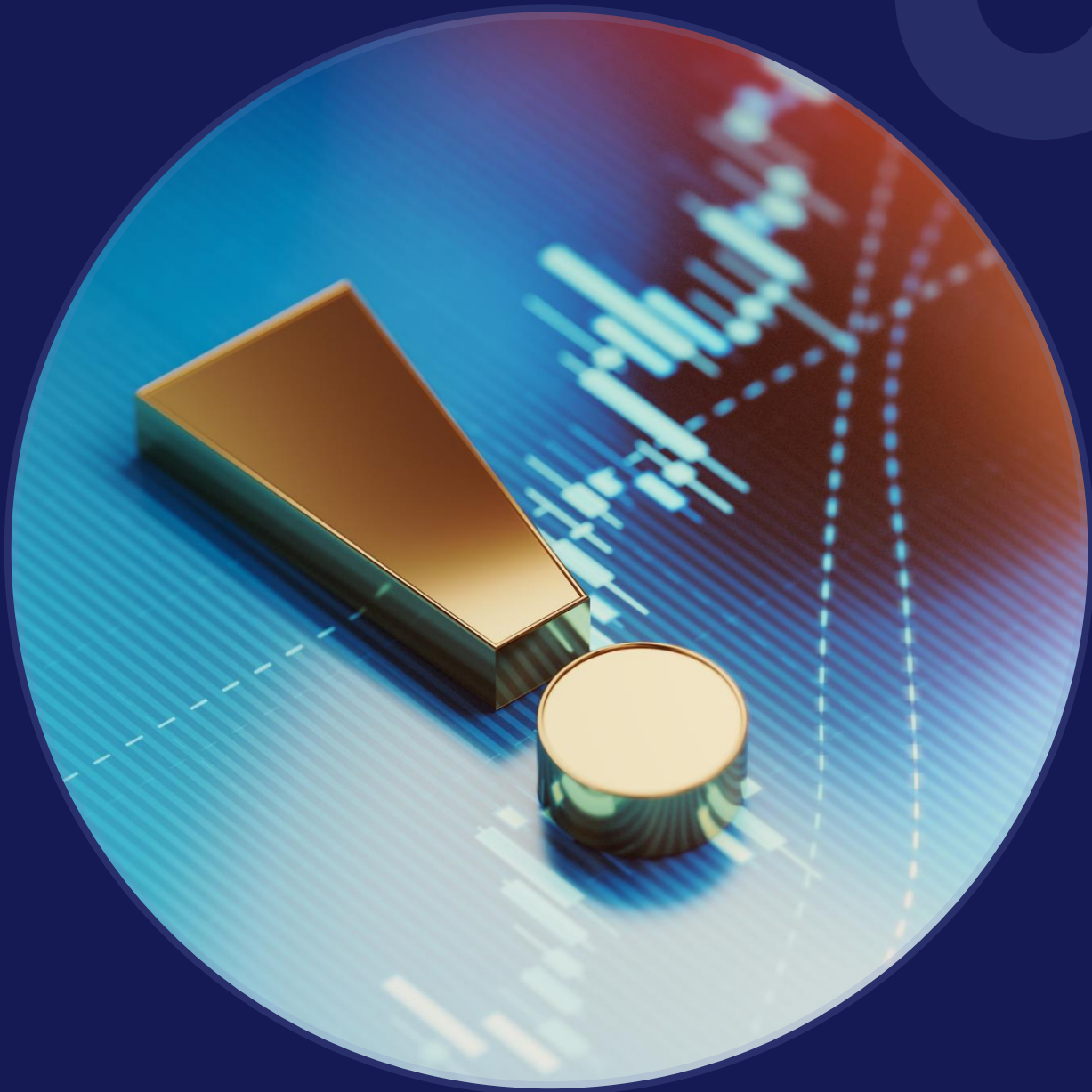# AffinityWater

AFW149 Economic Insight- Full RoRE method write up

RoRE risk assessment for Affinity Water

Company-specific RoRE risk following Draft Determinations at PR24

CONTENTS

1   Executive summary

Under Ofwat's Draft Determinations, between -7.28% (P10) and -1.86% (P90) of Affinity's RoRE could be at risk at PR24 (on the basis of a notional capital structure). Affinity has proposed some mitigations to manage this risk at source, to the extent possible within the bounds of the PR24 regulatory framework. Should Affinity's Representations be accepted in full, this range narrows and rebalances upwards, to between -5.19% (P10) to -0.08% (P90).[1] While the balance of risk will improve, we consider that the cost of equity would need to be increased (relative to Ofwat's Draft Determinations) to compensate for the materially higher downside risk. This is consistent with Affinity's own view, as expressed in its Representations.[2]

1A.   Introduction and context

As part of their Draft Determination Representations, companies are required to submit RoRE risk ranges that set out their view of risk both: (i) under Ofwat's Draft Determinations; and (ii) under their Representations (if accepted in full).

In this report, we present our assessment of the RoRE risk facing Affinity over PR24 under both of these scenarios. This has assisted Affinity in: (i) completing its regulatory submission and, in particular, the table ADD18; and (ii) the development of the mitigations put forward as part of its Representations.

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[1]   *These risk ranges have been calculated using a Monte Carlo models to aggregate each individual risk area (such as totex, retail costs, and financing costs etc), and is therefore not directly comparable to the range set out by Ofwat in the Draft Determinations.*
[2]   *Please refer to Affinity's Representation.*

1B.   Our approach

Broadly, our approach to conducting RoRE risk analysis closely tracks the approach we used to develop a view of risk under Affinity's Business Plan.[3] There are a number of notable exceptions:[4]

- **We have changed the way we use historical data in our calculation of totex risk**.   Specifically, for Affinity's Business Plan, Affinity-specific historical performance data covering the period PR99 to PR19 was used to calculate totex risk. However, we now use industry-wide data, and limit the time period used to cover PR14 to PR19. This is for the following reasons:

  - We understand the Affinity received feedback from Ofwat suggesting that the use of industry-wide data, rather than Affinity-specific data, is more appropriate to form a view of totex risk. There are arguments in favour of both approaches. Specifically, company-specific past performance may be more indicative of future performance if company-specific characteristics, or past operational/investment decisions are expected to result in unique risk profiles in this particular risk area for each company. On the other hand, industry-wide historical performance may be more indicative of possible future performance due to the greater number of observations provided by companies offering similar services, within the same industry, and subject to the same regulation. For the purposes of this analysis, we have chosen to implement our methodology using industry-wide data,[5] both to take on board Ofwat's feedback, and to allow us enough data points to limit our analysis to using only more recent time periods (please see below).

  - Sensitivity testing shows that the extent of the downside skew to the risk range is highly sensitive to the time period included in the analysis. Specifically, our analysis of industry-wide historical data shows the downside risk to firms on totex has been persistently increasing over subsequent price controls. This suggests that the industry-wide performance over recent price controls may be more reflective of companies' performance over PR24 than earlier price controls. With this in mind, we have used the results produced using PR14-PR19 historical totex performance data. This is because this choice of time period balances including a greater number of observations (than would be included if we used data from PR19 alone), with the likelihood that the most recent performance will be the best predictor of the future.[6]

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3   *['AFW20 – RoRE risk at PR24'](), Economic Insight (September 2023). Appendix to Affinity Water's Business Plan.*

4   *The below list is not an exhaustive list of changes made between constructing risk ranges under Ofwat's Determinations and Affinity's Representations, and Affinity's Business Plan. Full details per risk area are included in the relevant chapters within the main body of this report.*

5   *We note that, following discussions with Affinity, it considers that Southern Water's performance over the relevant period of our analysis may be less reflective of its likely performance if (as Ofwat puts it) part of the industry "overspend can be explained by Southern Water's turnaround programme". Therefore, to inform Affinity's view of its RoRE risk over PR24, we have excluded Southern Water from our analysis of the totex risk range.*

6   *Please see Section 2C for further details.*

- **We have combined outcome delivery incentives (ODIs) and measures of experience (MeX) into a single risk range, rather than constructing individual risk ranges for each**. This is because, in its Draft Determinations, Ofwat has stated that the MeX will be included within the outcomes aggregate sharing mechanism. As a result, the risk on the MeX can no longer be considered separately from ODIs.

- **We have expanded the financing risks modelled, in line with the approach taken by Ofwat in its Draft Determinations**. Following Ofwat, we now also include risk regarding the cost of index-linked debt in addition to the risks modelled before. Specifically, where a company's RCV is linked to CPIH, but a proportion of its debt is linked to RPI, its performance against the allowed cost of debt will be subject to the risk of variation in the RPI-CPIH wedge.

- **We have updated our view of the likely actual cost of new debt in light of recent increases in the rates faced by water companies.** The rates at which water companies issue debt have increased since Business Plans were submitted. This has led Ofwat to remove the downward adjustment of the benchmark index that was included in its early view in the Draft Determinations; and Affinity's Representations suggest that a further increase in in the allowed cost of new debt is necessary. We agree that it is important to take into account changes in the environment in which companies issue debt and have updated our view of the likely actual cost of new debt accordingly.

- **We only present our assessment of Affinity's 'actual' risk under the 'notional' capital structure of 55% gearing (as per Ofwat's guidance for table ADD18)**. For the purposes of supporting Affinity develop its Business Plan, we supplied an analysis of risk for: (i) the 'notional' firm under the 'notional' capital structure; (ii) the 'actual' firm under the 'actual' capital structure; and (iii) the 'actual' firm under the 'notional' capital structure. This is because we consider that:

  (i)   A view of risk for the 'notional' firm under the 'notional' capital structure provides the best evidence as to whether Ofwat's policy proposals for PR24 result in a balanced package of risk for efficient firms.

  (ii) A view of risk for the 'actual' firm under the 'actual' capital structure provides the best view as to the risk that Affinity *actually* faces over PR24.

  (iii) A view of the risk for the 'actual' firm under the 'notional' capital structure may be problematic. This is because equity risk varies with gearing, and so by using notional gearing, our risk ranges will be understated because they are expressed over an artificially high equity base.

  While we have reservations regarding the usefulness of (iii), this view of risk aligns with Ofwat's guidance for the RR30 and ADD18 tables; and allows for comparison with Ofwat's view of risk. In addition, the assessment of the balance of risk will be consistent under both approaches (ii) and (iii), and so it continues to be informative for Affinity's purposes. Therefore, for the purposes of this report, we only supply a view of the risk under (iii).

1C.   Summary of our results and implications

Overall, we present, in Table 1, an estimate of Affinity's RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the risk range from Affinity's Business Plan (risk under Affinity's BP),[7] and Ofwat's view of Affinity's risk at Draft Determinations (Ofwat's view of DD risk), for comparison.

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[7]   *Please see: 'AFW20: RoRE risk ranges (Economic Insight)', Economic Insight (September 2023), page 18.*

Table 1: Affinity RoRE risk range summary

Risk area	Risk under Affinity's BP		Ofwat's view of DD risk		DD risk			Risk under Affinity's Representations		
	P10	P90	P10	P90	P10	P50	P90	P10	P50	P90
Totex	-0.50%	0.49%	-1.24%	1.24%	-2.43%	-0.86%	1.19%	-2.07%	-0.94%	1.15%
Retail costs	-0.43%	-0.27%	-0.30%	0.30%	-1.29%	-0.45%	0.38%	-1.17%	-0.40%	0.35%
Revenue forecasting incentive	-0.03%	0.00%	-0.05%	0.00%	-0.01%	0.00%	0.00%	-0.01%	0.00%	0.00%
Financing	-0.28%	0.46%	-0.42%	0.90%	-1.85%	-0.18%	1.51%	-1.79%	-0.02%	1.78%
ODIs	-3.11%	0.85%	-2.50%	1.47%	-3.26%	-2.49%	-1.50%	-1.19%	-0.79%	-0.20%
MeX			-0.95%	0.95%						
PCDs	-1.68%	-0.54%	-0.17%	0.17%	-1.39%	-0.58%	-0.43%	-1.73%	-0.59%	-0.46%
Total (simple aggregation)	-6.33%	1.29%	-5.66%	5.03%	-10.24%	-4.55%	1.14%	-7.96%	-2.75%	2.62%
Total (Monte Carlo aggregation)	-5.35%	0.31%	N/A	N/A	-7.28%	-4.62%	-1.86%	-5.19%	-2.68%	-0.08%

Sources: Economic Insight analysis, PR24 Draft Determinations,[8, 9, 10, 11] and 'RoRE risk at PR24', Economic Insight (2023), page 18.

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[8] 'PR24 Wholesale cost RoRE model', Ofwat (2024).

[9] 'PR24 draft determinations: Aligning risk and return appendix', Ofwat (2024).

[10] 'PR24 ODI risk - Monte Carlo RoRE payment consolidated', Ofwat (2024).

[11] 'Risk ranges for PCD', Ofwat (2024).

As shown (when aggregating using a Monte Carlo approach), between -7.28% (P10) and -1.86% (P90) of Affinity's RoRE could be at risk over PR24, under Ofwat's Draft Determinations. The range is between -10.24% (P10) and 1.14% (P90) when using a simple aggregation approach.

This shows that the risk facing Affinity over PR24 under Ofwat's Draft Determinations is materially skewed to the downside. Key contributors to this downside risk include totex, outcomes (ODIs and MeX) and Price Control Deliverables (PCDs).

Based on these risks, Affinity has proposed a series of mitigations as part of its Representations, summarised below.

- To mitigate **totex** risk, these include:

    - a decrease in the aggregate sharing mechanism threshold from ±2% to ±1%; and

    - an increase in enhancement allowances.

- To mitigate outcomes risk, these include:

    - a decrease in ODI rates;

    - the application of a symmetrical cap and collar at ±0.4% RoRE on the Per capita consumption (PCC) ODI;

    - a deadband to the dry year level on the PCC ODI, and reverting to the PCL submitted within Affinity's Business Plan;

    - the introduction of an embedded greenhouse gas emissions performance commitment (PC);

    - the removal of the low pressure bespoke PC; and

    - a reduction in the aggregate sharing mechanism thresholds on outcomes – whereby the ±5% threshold reduces to ±3%; and the ±3% threshold reduces to ±1%.

- To mitigate PCD risk, these include:

    - The introduction of an additional PFAS PCD.[12]

    - An increase in enhancement allowances to reduce the risk of delays (which also relates to totex above).

Should these Representations be accepted in full, we estimate that the RoRE at risk for Affinity over PR24 would be between -5.19% (P10) and -0.08% (P90). This is a significantly narrower range than under Ofwat's Draft Determinations, and has become more balanced. However, we consider that in order to be financeable over PR24, the cost of equity would need to be increased in order to compensate for the materially

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[12]   *Further information regarding the specifics of these mitigations can be found in Affinity's Representations.*

higher downside risk, even under its Representations. This is consistent with Affinity's position, whereby a higher WACC of 4.23% is also being proposed.

1D.   Structure of this report

In the remainder of this report, we take each risk area in turn, setting out:

- A detailed commentary regarding the individual risk range results under Ofwat's Draft Determinations, and Affinity's Representations;

- Our detailed methodology for developing a view of risk for each area; and

- If, and how, our methodology has developed from the Business Plan submission.

We then set out how we have aggregated individual risks to generate our overall risk ranges, making use of Monte Carlo models.

2   Totex RoRE risk

Based on the industry's historical performance on totex, between -2.43% (P10) and +1.19% (P90) of Affinity's RoRE could be at risk on totex at PR24, under Ofwat's Draft Determinations. This is highly negatively skewed and wider than Ofwat's view. Should Affinity's Representations be accepted in full, this range narrows, and rebalances slightly upwards, to between –2.07% (P10) and +1.15% (P90) RoRE. This is primarily the result of Affinity's proposal to reduce the threshold for the aggregate sharing mechanism on totex from ±2% to ±1%.

2A.   Introduction and overview of our results

In this chapter we present our assessment of the totex risk Affinity faces over PR24 under: (a) Ofwat's Draft Determinations: and (b) should Affinity's Representations be accepted in full.

Context

The totex RoRE risk at PR24 captures the likelihood of Affinity's total expenditure being above or below the allowances Ofwat sets. Totex risk is therefore both a function of: (a) the allowances Ofwat sets (i.e. how much totex it allows); and (b) company performance ex-post (i.e. how efficient Affinity is, over PR24).

Approach

In the above context, no two price controls are identical (i.e. both Ofwat's method, and company plans, vary over time). However, at each price control, in principle Ofwat is *endeavouring* to set the 'right' efficient cost (subject to measurement error); and companies are *endeavouring* to be efficient. Historical data can therefore be interpreted as providing information on the risk of companies over/underperforming due to *both* regulatory forecast error *and* company performance.

Given this, to the extent that the scope for measurement error and variation in company performance at PR24 is similar to the past (although, as we explain below, the more recent past may be more reflective than previous price controls), an analysis of historical outturn data provides a useful indicator of potential future totex risk.

Therefore, to construct our totex risk range we analyse companies' historic outturn totex performance against their allowances, before using this to infer the expected range of Affinity's totex performance over PR24. We consider this to be the most suitable approach to assessing risk at PR24.

Overview of results and Affinity's Representations

Below, we present our assessment of Affinity's totex RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the totex risk range from Affinity's Business Plan (risk under Affinity's BP),[13] and Ofwat's view of Affinity's totex risk at Draft Determinations (Ofwat's view of DD risk), for comparison.

Table 2: Totex risk ranges for PR24

	Risk under Affinity's BP	Ofwat's view of DD risk	DD risk	Risk under Affinity's Representations
P10	-0.50%	-1.24%	-2.43%	-2.07%
P50	N/A	N/A	-0.86%	-0.94%
P90	0.49%	1.24%	1.19%	1.15%

Sources: Economic Insight analysis and 'Totex RORE calcs for given cost variance', Ofwat (July 2024).
Note: The 'risk under Affinity's BP' range is calculated using historical industry-wide data for all firms. The 'DD risk' and 'risk under Affinity's Representations' ranges are calculated using historical industry-wide data for all firms with the exception of Southern. This is explained in greater detail in Section 2B.

As shown, under Ofwat's Draft Determinations we expect between -2.43% (P10) and 1.19% (P90) of Affinity's RoRE to be at risk over PR24. Unlike Ofwat's view, we consider that the risk on totex is strongly negatively skewed.

At Representations, Affinity has proposed reducing the thresholds for the totex aggregate sharing mechanism to ± 1% RoRE. This has the effect of both narrowing the risk Affinity faces, and slightly rebalancing the risk towards the upside. Should Affinity's Representations be accepted in full, we estimate that Affinity will face a RoRE risk of between -2.07% (P10) and 1.15% (P90) over PR24.

The above range provides the best view of Affinity's actual totex risk at PR24 (on the basis of a notional capital structure) given the historical performance across the industry. The performance of any individual company may be better (or, worse) than the historical industry performance indicates. In particular, we note that (as per the analysis in Affinity's Business Plan) analysis of Affinity's totex performance over a

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[13]   Please see: 'AFW20: RoRE risk ranges (Economic Insight)', Economic Insight (September 2023), page 18.

longer timeframe (PR99 to PR19) indicates a relatively narrow and symmetrical risk range.

However, at PR24, there are reasons to believe that totex performance may be worse (i.e. more skewed to the downside) than the historical industry performance indicates. This is because Affinity, similarly to companies across the industry, expects significant changes to the scale of its investment programme (for instance, under Affinity's Representations, enhancement expenditure is expected to increase from £315m at PR19[14] to £719m at PR24[15]). Should the nature of this investment also differ from the past (for instance should individual projects be larger and more innovative than was typically seen in prior price controls), the combination of these factors could affect totex risk, by plausibly affecting the variation in company performance. Intuitively, companies could be at greater risk of overrun on new, innovative, and large-scale capex projects, relative to familiar and smaller scale projects.[16] Therefore, if the proportion of the former type of project increases relative to the latter, the extent of downside risk at PR24 may increase relative to what has been observed in the past. In addition, the increase in scale of the investment programme alone could apply greater pressure to the supply chain, increasing supply chain risk. The implication of this is that relying solely on historical performance (and specifically performance on totex as a whole) may fail to capture the effect of these expected changes to investment, and as a result potentially understate the extent of the downside risk facing firms at PR24.

In the remainder of this chapter, we detail the methodology we have used to arrive at this view, along with any changes to our methodology since our analysis of risk under Affinity's Business Plan.

2B.   Details of our methodology

In high-level terms, our method analyses companies' historical outturn totex performance against their allowances, before using this to infer the expected range of Affinity's totex performance over PR24. To implement this method, we undertake the following steps:

a.   First, we calculate each company's historical out- or under-performance against their wholesale totex allowances over each price control, expressing this performance as a percentage variation above/below the allowance. The data we have gathered allows us to do this from PR99 to PR19, however the final range we present is the results produced using PR14 and PR19 data only (our reasoning for this is explained below).

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[14]   *2022-23 prices. (£267m in 2017-18 prices, please refer to 'PR19 Final Determinations: Affinity Water Final Determinations', Ofwat (December 2019) page 32.)*

[15]   *2022-23 prices. Please refer to Affinity's Representations..*

[16]   *This is consistent with experience captured in academic and grey literature. For instance, please see: 'What Causes Cost Overrun in Transport Infrastructure Projects?' Flyvbjerg, B; et al. Transport Reviews, 24:1, 3-18 (2004); and https://www.economist.com/britain/2018/12/08/britains-engineering-reputation-goes-down-the-tube.*

b. We then pool the industry-wide performance data, taking PR14 and PR19 performance as separate data points, before taking the 10th and 90th percentile to generate a P10 to P90 performance range on which our final risk range is based. Again, at this stage, the P10 and P90 are expressed as a percentage variation from the totex allowance.

c. We then multiply these figures by Affinity's expected totex allowance at PR24, such that the P10 and P90 are now expressed as £s values. To model the risk under Ofwat's Draft Determinations, we use Affinity's allowed totex as set out within the Draft Determinations, and similarly to model the risk under Affinity's Representations, we use the revised allowances that Affinity have put forward.

d. Next, we calculate a weighted average cost sharing rate. At Draft Determinations, Ofwat proposed cost sharing rates that differ between base and enhancement expenditure. Specifically, Ofwat proposed cost sharing rates of 50:50 for Affinity on base expenditure (based on Affinity's "Standard" QAA categorisation) and lower cost sharing rates of 40:40 on enhancement spend.[17] We take a weighted average of these rates, based on Affinity's relative proportion of base and enhancement expenditure in AMP8 (under Ofwat's Draft Determination view and Affinity's Representation position respectively), to calculate Affinity's average cost sharing rate for each view of risk.

e. We then apply cost sharing to the values calculated in step c. and convert this to a % of RoRE using Affinity forecasted RCV for PR24, along with Ofwat's view of notional gearing (55%).[18] To calculate the risk under Ofwat's Draft Determinations, we use Affinity's RCV as reported by Ofwat in its Draft Determinations along with the relevant cost sharing rate from step d., and similarly use Affinity's revised RCV and cost sharing rate consistent with the Representations to construct the view of risk under the Representations.

f. Finally, we apply the aggregate sharing mechanism, with a threshold of ±2% RoRE to calculate the risk under Ofwat's Draft Determinations;[19] and of ±1% RoRE to calculate the risk range under Affinity's Representations.

We note that, following discussions with Affinity, it considers that Southern Water's performance over the relevant period of our analysis may be less reflective of its likely performance if (as Ofwat puts it) part of the industry "overspend can be explained by Southern Water's turnaround programme". Therefore, to inform Affinity's view of its RoRE risk over PR24, we have excluded Southern Water from our analysis of the totex risk range.

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[17] *'PR24 Draft Determinations: Expenditure allowances', Ofwat (July 2024), pages 161-162. Note that Affinity's enhancement allowances do not cover the three enhancement expenditure areas where enhanced sharing rates of 25:25 apply (IED enhancement expenditure; certain large non-complex schemes; and strategic regional options contingent funding).*

[18] *We note that, as outlined in Affinity's Representation, Affinity considers the appropriate notional gearing level to be 60%. We use 55% notional gearing for the purposes of the RoRE risk calculations for comparability with the Draft Determinations.*

[19] *'PR24 Draft Determinations: aligning risk and return' Ofwat (July 2024), page 14.*

As shown in the table below, the effect of removing Southern from the data set reduces the P10 level of risk (by 42 basis points), and slightly increases the P90 (by 8 basis points).

Table 3: Totex RoRE risk sensitivity analysis (DD risk)

	Totex RoRE risk for Affinity under Ofwat's Draft Determination, **including all companies**	Totex RoRE risk for Affinity under Ofwat's Draft Determination, **excluding Southern**
P10	-2.85%	-2.43%
P50	-1.21%	-0.86%
P90	1.11%	1.19%

Source: Economic Insight analysis.

Both of these risk ranges are heavily skewed to the downside, suggesting that, while including Southern increases the downside skew, it is not the key driver of the downside skew that we observe. We also note that we do not consider Southern to be a true outlier, since the company does not perform far worse than the next worst performer in the industry, based on historical analysis.[20] However, we understand that Affinity considers the risk range produced following the removal of Southern to be more reflective of the risk they expect to face over PR24, and have therefore presented this latter range in our overall results.

2C. Changes to our approach since Business Plan submission

As shown in Table 2, the totex risk range for Affinity calculated at the Business Plan stage significantly differs from our view risk following the Draft Determinations. This is a result of several changes we have made, largely due to Ofwat's revised methodology and Ofwat's feedback to Affinity. Key changes include: (a) moving to using industry-wide data; and (b) limiting the time period to PR14-PR19. The reasoning for, and impact of, these changes are explained in detail below.

The use of Affinity-only, or industry-wide data

In Affinity's Business Plan, Affinity-specific data was used to estimate totex risk. However, to form a view of Affinity's risk under both the Draft Determinations, and should Affinity's Representations be accepted in full, we now use industry-wide data.

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[20] *Across the four years of available PR19 data, Southern Water has overspent against its allowances by 33%. By comparison, the next worst performer, South West Water, has overspent against its allowances by 30%. At PR14, Southern Water underspent against allowances by 0.5%, ranking 6th of 17 companies within the industry by this measure of performance.*

There are arguments in favour of both approaches. Specifically, company-specific past performance may be more indicative of future performance if company-specific characteristics, or past operational/investment decisions are expected to result in unique risk profiles in this particular risk area for each company. On the other hand, industry-wide historical performance may be more indicative of possible future performance due to the greater number of observations provided by companies offering similar services, within the same industry, and subject to the same regulation.

In its Business Plan feedback to Affinity, Ofwat requested that Affinity use industry-wide data to estimate a totex risk range. Given this, and the increased number of data points that using industry-wide data provides (in light of the changes we have made regarding time period, explained in detail below), we have chosen to update our approach to using industry-wide performance data to estimate Affinity's totex risk at this stage.

The time period included in the analysis

There is no 'right' answer in terms of the time period to use within this analysis. There is a tension between: (a) having a large sample size (i.e. including as many years as possible to maximise the number of observations on which the results are based); and (b) including only the data that is expected to have strong predictive power (i.e. excluding earlier years that may be less reflective of the future). We have therefore conducted sensitivity testing to understand the extent to which the RoRE range may change according to the time period chosen, and to therefore help inform the most appropriate time period to use.

The inclusion of PR19

Firstly, we have conducted sensitivity testing to investigate whether it is appropriate to include PR19 data within our analysis. As the most recent price control period, its inclusion is desirable given that it may be most reflective of the future. However, as we are only partway through the period, one potential drawback of using this data is that we are relying on 4-years-worth of data to represent totex performance for the full price control. Doing so could skew our results, *if* there is reason to believe that companies either front-load or back-load their expenditure. For example, if there is a tendency for firms to *overspend* at the start of a price control and *underspend* at the end, then using only 2020-24 data would produce more negatively skewed results than we would see if we had 5 years of data.

Our sensitivity tests show that this is not the case: firm spending is relatively consistent throughout price controls, with a slight tendency for higher spending at the end of the period. This is true for both Affinity and the wider industry, as illustrated below:

Table 4: Average proportion of total spending by companies in each year of the price control (PR99-PR14)

	Year 1	Year 2	Year 3	Year 4	Year 5
Industry average	19.41%	19.87%	20.11%	20.36%	20.25%

Source: Economic Insight analysis

We consider that this strongly supports the inclusion of PR19 data within the analysis, as we gain the benefit of a more recent view of performance, and if anything, suggests the results produced including PR19 data could result in an *underestimation*, or conservative view of the future downside risk.

The exclusion of early price control periods

Having established that it is appropriate to include PR19 data in the analysis, we must then decide how many price control periods prior to this, if any, should be included. To inform this decision, we conducted a further series of sensitivity checks, in order to establish the extent to which the risk range produced varies according to the time period chosen.

As shown in the table below, we set out the results obtained when we include the full period, (from PR99 to PR19); and then when we begin limiting the price control periods used – beginning with the exclusion of PR99 alone, right up to excluding all price controls up to and including PR14.

Table 5: Totex risk ranges produced by varying the time period included in the analysis (DD risk)

	PR99-PR19	PR04-PR19	PR09-PR19	PR14 – PR19	PR19 only
P10	-1.80%	-2.03%	-2.15%	-2.43%	-3.18%
P90	1.77%	1.70%	1.82%	1.19%	-0.06%

Source: Economic Insight analysis.
Note: These results are produced after adjustments for cost sharing and the aggregate sharing mechanism.

As shown, the totex risk range becomes increasingly negatively skewed, the more one restricts the price controls used to be more recent, reflecting the fact that the downside risk to firms has been persistently increasing over time.

On this occasion, and reflecting the increasingly stretching nature of subsequent price controls, we consider that it is appropriate to take the results produced using PR14-PR19 historical totex performance data (the results highlighted in purple in the table above). This is because this choice of time period balances including a greater number of observations (than would be included if we used data from PR19 alone), with the likelihood that the most recent performance will be the best predictor of the future.

Other methodological differences between the ranges calculated at BPs and DDs

We have made several additional methodological changes since conducting the risk analysis for Affinity's Business Plan submission, as further information has been made available. Below lists the assumptions made at the Business Plan stage which now differ from those used to estimate Affinity's RoRE risk range following the Draft Determinations.

- **Cost sharing**: In constructing a risk range for Affinity's Business Plan, we assumed a 50:50 cost sharing ratio on both base and enhancement expenditure, in line with Ofwat's Final Methodology. We now apply a 40:40 cost sharing rate for enhancement expenditure, in line with Ofwat's Draft Determinations.

- **Aggregate sharing mechanism**: At Business Plans, we did not include an aggregate sharing mechanism on totex, as per Ofwat's Final Methodology.

- **Input data**: The Business Plan data range was constructed using the most up-to-date data available at that point in time. We now incorporate additional performance data on over and underspend for 2023-24 from the latest Annual Performance Report.[21]

- **Triangular distributions**: Since Business Plan submissions, we have updated our approach to construct triangular distributions from historical data for use in our Monte Carlo model. This change is explained in more detail in Chapter 8.

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[21] *Specifically, we have incorporated data from version 'V1' of the 2023-24 APR industry datashare.*

3 Retail cost risk

Based on the industry's historical performance, between -1.29% (P10) and 0.38% (P90) of Affinity's RoRE could be at risk on retail costs at PR24, under Ofwat's Draft Determinations. Should Affinity's Representations be accepted in full, between -1.17% (P10) and 0.35% (P90) of Affinity's RoRE could be at risk. The limited observed changes result solely from changes to Affinity's forecast RCV under its Representations. No mitigations have been proposed by Affinity to directly target retail cost risk.

3A. Introduction and overview of our results

In this chapter we present our assessment of the retail cost risk Affinity faces over PR24 under Ofwat's Draft Determinations, and under Affinity's Representations.

Context

Similarly to totex RoRE risk, retail cost risk at PR24 captures the likelihood of Affinity's retail cost expenditure being above or below the allowances Ofwat sets. It is therefore both a function of: (a) the retail cost allowances Ofwat sets; and (b) company performance ex-post (i.e. how efficient Affinity is with respect to retail costs, over PR24).

Approach

Our approach to considering retail cost risk therefore closely follows our approach to considering wholesale totex risk – we use historical performance to assess the forward-looking risk since historical performance captures both the risk of companies over/underspending due to both regulatory forecasting error, and company performance.

Retail costs at PR24 are not expected to be subject to the scale of change anticipated for totex, and therefore we consider a historical performance analysis sufficient to inform our view.

Overview of results and Affinity's Representations

In Table 6, we present our assessment of Affinity's retail cost RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the retail cost risk range from Affinity's Business Plan (risk under Affinity's BP),[22] and Ofwat's view of Affinity's retail cost risk at Draft Determinations (Ofwat's view of DD risk), for comparison.

Table 6: Retail cost RoRE risk range

	Risk under Affinity's BP	Ofwat's view of DD risk	DD risk	Risk under Affinity's Representations
P10	-0.43%	-0.30%	-1.29%	-1.17%
P50	N/A	N/A	-0.45%	-0.40%
P90	-0.27%	0.30%	0.38%	0.35%

Source: Economic Insight analysis, and 'PR24 Draft Determinations: aligning risk and return', Ofwat (July 2024), page 13.

As shown, between -1.29% (P10) and 0.38% (P90) of Affinity's RoRE could be at risk at PR24 following Draft Determinations. This negatively skewed risk range reflects the fact that, across the industry, companies have tended to overspend against their allowances. Specifically, the P10 level of performance over PR14 and PR19, across the industry, is a 35.1% overspend against allowances, while the P90 level of performance has been a 10.4% underspend.

Affinity does not propose any risk mitigations at Representations that directly impact retail costs. Therefore, the difference between the 'DD risk' and 'risk under Affinity's Representations' ranges is driven solely by the updated RCV numbers Affinity propose as a result of broader changes being put forward within the Representations.

Table 6 also shows that our estimate of the risk that Affinity faces on retail costs is significantly different to the range we calculated under Affinity's Business Plan. As with totex, this difference is driven primarily driven by the move from using Affinity-only data to industry-wide data, as requested by Ofwat. On an industry basis, there is far more variation in performance on retail costs, which results in a much wider (although still negatively skewed) risk range for retail costs following the Draft Determinations.

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[22]   *Please see: 'AFW20: RoRE risk ranges (Economic Insight)', Economic Insight (September 2023), page 18.*

In the remainder of this chapter, we detail the methodology we have used to arrive at this view, along with any changes to our methodology since our analysis of risk under Affinity's Business Plan.

3B.   Details of our methodology

In order to construct a risk range for retail costs, we implement a very similar methodology to that used to construct our risk range for totex.   Specifically, we undertake the following steps:

a.   First, we calculate each company's historical out- or under-performance against their retail cost allowances over each price control, expressing this performance as a percentage variation above/below the allowance. The data available allows us to do this from PR14 onwards, including the full PR14 price control period and the first four years of PR19.[23]

b.   We then pool the industry-wide performance data, taking PR14 and PR19 performance as separate data points, before taking the 10th and 90th percentile to generate a P10 to P90 performance range on which our final risk range is based. Again, at this stage, the P10 and P90 are expressed as a percentage variation from the totex allowance.

c.   We then multiply these figures by Affinity's expected retail cost allowance at PR24 such that the P10 and P90 are now expressed as £s values. Since Affinity is proposing no changes to retail costs in its Representations, we use the same cost allowance to construct both the 'DD risk' and 'risk under Affinity's Representations' risk ranges.

d.   Finally, we convert these figures to a % of RoRE using Affinity's forecast RCV for PR24, along with Ofwat's view of notional gearing (55%).[24] To construct the 'DD risk' range, we use the forecast RCV figures reported by Ofwat in its Draft Determinations. To construct the 'risk under Affinity's Representations' range, we use the revised forecast RCV figures from Affinity's Representations.

3C.   Changes to our approach since Business Plan submission

We have made the following changes to our calculation of retail cost risk between Business Plan submissions and Draft Determinations:

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[23]   *Ofwat's 2019-20 SDR, 2021-22 WCPR, 2022-23 WCPR, and 2023-24 APR industry datashare (version 'V1').*
[24]   *We note that, as outlined in Affinity's Representation, Affinity considers the appropriate notional gearing level to be 60%. We use 55% notional gearing for the purposes of the RoRE risk calculations for comparability with the Draft Determinations.*

- **Industry-wide data**: As set out above, at Business Plan submissions, we calculated Affinity's retail cost risk based on Affinity's past performance. For consistency with our updated totex method, and in response to Ofwat's feedback, we now use industry-wide data to assess the risk Affinity faces under Ofwat's Draft Determination and should Affinity's Representations be accepted in full. The rationale for this is consistent with our rationale for updating our totex risk methodology, and explained in more detail in Section 2C.

- **Input data**: Since Business Plan submission, an extra year of outturn data (2023-24) has become available, which has been incorporated into our more recent analysis.[25]

- **Triangular distributions:** As for totex, since Business Plan submissions we have updated our approach to construct triangular distributions from historical data for use in our Monte Carlo model. This change is explained in more detail in Chapter 8.

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[25] *Specifically, we have incorporated data from version 'V1' of the 2023-24 APR industry datashare.*

4 Revenue forecasting incentive risk

In this chapter, we present our assessment of the RoRE risk exposure resulting from the revenue forecasting incentive (RFI) for Affinity at PR24. Based on a historical analysis of Affinity's revenue forecasting performance, between -0.01% (P10) and 0.00% (P90) of Affinity's RoRE could be at risk at PR24, under Ofwat's Draft Determinations. This remains the case should Affinity's Representations be accepted in full. No mitigations have been proposed to directly target RFI risk.

4A. Introduction and results summary

In this chapter we present our assessment of the risk that Affinity faces as a result of the RFI over PR24, under both Ofwat's Draft Determinations, and should Affinity's Representations be accepted in full.

Context

The RFI has been designed with the objective of incentivising companies to accurately forecast their own revenue. RFI risk is therefore a function of company performance with regard to revenue forecasting.

Approach

Given that there is no reason to believe that Affinity's ability to forecast revenues will change significantly compared to the past, we consider that historical outturn performance provides the most appropriate indicator of potential future risk. We have therefore grounded our risk assessment for this area in historical analysis. In addition, due to company performance likely being a function of internal processes (including data collection and analysis), we consider that company-specific historical performance, rather than historical performance across the industry, will best indicate likely future performance for any one company. As a result, to construct an Affinity-specific risk range for revenue incentive mechanism risk, we have used data regarding Affinity's own past performance.

Overview of results and Affinity's Representations

In Table 7: RFI risk ranges for PR24, we present our view of Affinity's RFI RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the RFI risk range from Affinity's Business Plan (risk under Affinity's BP),[26] and Ofwat's view of RFI risk at Draft Determinations (Ofwat's view of DD risk), for comparison.

Table 7: RFI risk ranges for PR24

	Risk under Affinity's BP	Ofwat's view of DD risk	DD risk	Risk under Affinity's Representations
P10	-0.03%	-0.05%	-0.01%	-0.01%
P50	N/A	N/A	0.00%	0.00%
P90	0.00%	0.00%	0.00%	0.00%

Sources: Economic Insight analysis, 'PR24 draft determinations: Aligning risk and return appendix', Ofwat (2024), page 21, and 'RoRE risk at PR24', Economic Insight (2023), page 18.

As shown, under Ofwat's Draft Determinations, between -0.01% (P10) and 0.00% (P90) of Affinity's RoRE could be at risk due to the RFI at PR24. The P90 of 0.00% reflects that this incentive mechanism is penalty-only, and therefore that there is no possibility of earning a positive return.

This is narrower than the view expressed by Ofwat in its Draft Determinations, reflecting that, historically, Affinity has performed within, or very close to, the deadband of 2% revenue forecasting error. We should however note that any delay to the Final Determinations could affect the RoRE at risk here, since this may affect the time available for companies to conduct their revenue forecasting.[27] The ranges presented above assume that there is no delay to the publication of Final Determinations.

We do not expect the risk range to change under Affinity's Representations, and Affinity has not proposed any mitigations to directly target this risk.

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[26] Please see: 'AFW20: RoRE risk ranges (Economic Insight)', Economic Insight (September 2023), page 18.

[27] We understand that Ofwat's recent consultation regarding the licence modification could allow Ofwat to delay final determinations until January 2025. https://www.ofwat.gov.uk/wp-content/uploads/2024/07/Consultation-on-proposed-modification-to-Condition-B.pdf

In the remainder of this chapter, we detail the methodology we have used to arrive at this view, along with any changes to our methodology since our analysis of risk under Affinity's Business Plan.

4B.   Details of our methodology

As set out above, to estimate RFI risk, we have made use of historical data to estimate the likely range of performance Affinity can expect over PR24 with respect to the incentive, before calculating the financial implications of this range of performance expressed as a percentage of regulatory equity. Specifically, to implement this method:

a.   We first collect data on allowed and recovered revenues from 2015-16 onwards for Affinity,[28] in order to calculate the percentage revenue forecast error in each year of PR14 and PR19 so far. As set out above, for this risk area we use Affinity-only data because we consider that Affinity's ability to forecast revenue going forward is best informed by its own past performance, rather than that of the industry as a whole.

b.   We take the minimum, maximum and mean level of performance over this period, in order to construct a simple triangular distribution of Affinity's performance. For Affinity, the minimum forecast error was 0.01% over the period, the mean forecast error was 1.47%, and the maximum forecast error was 3.04%.

c.   We convert this performance distribution from being expressed in terms of the percentage revenue forecast error, to the financial implication (or in other words penalty) that Affinity would face as a result of this level of performance. We do this by combining information published by Ofwat in its Draft Determinations regarding how the incentive is intended to work at PR24,[29] with both: (i) Ofwat's allowed revenues as specified in the Draft Determinations to produce the Draft Determination view; and (ii) the allowed revenues forecast by Affinity under their Representations, to produce the view of risk under Affinity's Representations. Specifically, we:

–   apply no penalty where actual revenues are expected to differ from allowed revenues by less than ±2%;

–   apply a penalty rate of 3% to the difference between expected actual and allowed revenues where this difference is greater than ±3%; and

–   apply a graded penalty rate to the difference between expected actual and allowed revenues where this difference is between ±2% and ±3%. In this range, the penalty rate increases linearly from zero (at a forecasting error ±2%) to 3% (at a forecasting error of ±3%).

> – adjust the penalties to reflect that there is a 2-year lag between the time at which the penalty is incurred (or in other words, when the performance takes place) and the collection of the penalty (when future allowed revenues are adjusted). To do this, we increase the amount of the penalty by two years' inflation (assumed to be 2%) and adjust for the time value of money (using the WACC under the Draft Determinations and Affinity's Representations, respectively, for the two risk ranges).

d. Finally, we convert this distribution of financial penalties to a % of RoRE using the 55% level of notional gearing,[30] along with both: (i) Ofwat's forecast RCV for Affinity under its Draft Determinations; and (ii) Affinity's forecast RCV for PR24 under its Representations, to produce both of our risk ranges.

It should be noted that the approach taken here to arrive at the P10 and P90 levels of risk differs from that used for totex and retail costs. Specifically, for totex and retail costs, we use the P10 and P90 historical levels of performance across the industry, and take these levels of performance forward as the parameters of our risk range. In contrast, here we use the minimum, mean and maximum level of performance to construct a simple triangular probability distribution, from which we infer the P10 and P90 performance levels expected over PR24. Details to explain why we have taken these differing methodological approaches are set out in Chapter 8.

4C. Changes to our approach since Business Plan submission

We have made the following changes to our calculations for estimating RFI risk between Business Plan submissions and Draft Determinations:

- **Input data**: We have updated the historical data used in our analysis to include industry-wide revenue forecasting performance for 2024.[31] For the purposes of calculating the risk range under Affinity's Business Plan, this year of data was unavailable.

- **Penalty calculations**: We have updated the method for calculating financial penalties to reflect Ofwat's decision to retain the grading of the penalty rate between 2% and 3% in the Draft Determinations, rather than to introduce a flat penalty rate as had been proposed earlier. We have also adapted the manner in which the inflation and financing cost adjustments are implemented when calculating expected penalties to align with our latest understanding of Ofwat's method.

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[30] *We note that, as outlined in Affinity's Representation, Affinity considers the appropriate notional gearing level to be 60%. We use 55% notional gearing for the purposes of the RoRE risk calculations for comparability with the Draft Determinations.*

[31] *As reported in the 'APR Industry Datashare 2024 Publish V1.1' dataset.*

- **Triangular distributions**: As for all other risk areas, since Business Plan submissions we have updated our approach to construct triangular distributions from historical data for use in our Monte Carlo model. This change is explained in more detail in Chapter 8.

5   Financing cost risk

In this chapter, we present our assessment of the RoRE risk exposure on financing costs for Affinity at PR24. Using an approach that is consistent with Ofwat's calculations of the financing risk range facing the notional firm, between -1.85% (P10) and 1.51% (P90) of Affinity's RoRE could be at risk at PR24 under Ofwat's Draft Determinations. Should Affinity's Representations be accepted in full, this range widens and shifts upwards to -1.79% (P10) and 1.78% (P90). This is largely a result of the proposed increase in the allowed cost of new debt.

5A.   Introduction and results summary

In this chapter we present our assessment of the risk Affinity faces as a result of the financing costs over PR24, under both Ofwat's Draft Determinations, and should Affinity's Representations be accepted in full.

Context

Broadly, there are three different areas of risk to consider when modelling financing cost risk:

- **First, there are inflationary risks regarding fixed-rate debt.** A proportion of Affinity's RCV is funded by fixed-rate debt, for which the interest costs will remain constant. However, the RCV on which the cost of debt allowance is applied may change based on inflation. This implies that company performance against the allowed cost of debt is subject to inflation risk, and is therefore driven by the share of fixed-rate debt that the company has, as well as the level of outturn inflation.

- **Second, there are inflationary risks regarding RPI-linked debt.** While the RCV to which the cost of debt allowance is applied is indexed based on CPIH, interest on part of Affinity's debt is linked to RPI. Consequently, company performance against the allowed cost of debt is subject to the risk of the wedge between RPI and CPIH varying over time. As with the first risk area, this risk depends on Affinity's debt structure as well as outturn RPI and CPIH inflation.

- **Finally, there are risks relating to the cost of financing new debt**. At PR24, Ofwat will set an allowance for the cost of new debt based on a trailing average of two indices – the A- and BBB-rated iBoxx 10+ indices (as published by IHS Markit). Therefore, the RoRE risk Affinity faces over AMP8 in relation to the financing of new debt is a function of whether it is able to issue new debt at a rate above or below this index.

Approach

In line with Ofwat's methodology for undertaking a risk analysis of financing costs, we model the risks set out above, relating to: (i) the inflationary risk of fixed-rate debt; (ii) the RPI-CPIH wedge risk of index-linked debt; and (iii) performance against the cost of new debt allowance.

With regard to (i) and (ii), we estimate distributions of outturn RPI and CPIH inflation based on historical outturn data. We then calculate the RoRE impact of each inflation scenario using Affinity's actual forecast debt structure (but notional gearing).

With regard to (iii), we start from Ofwat's risk analysis in the Draft Determinations and apply an adjustment to reflect our view that the actual cost of new debt will be higher than Ofwat estimated. Ofwat's view is that companies will be able to issue debt at rates similar to the yield on the benchmark index. However, we understand based on KPMG's view in the industry-wide project, that this view does not fully reflect the most recent increases in the rates at which water companies have issued debt, which may persist into AMP8. In addition, the recent report published by Moody's credit agency states that its future scores regarding the stability and predictability of the UK Water industry regime may fall, which again indicates that it may not be possible for companies to issue debt at the rates at which Ofwat expects in future.[32] Therefore, we adjust the performance ranges derived by Ofwat to account for this.

Based on that, we then calculate the RoRE impact of each scenario using Affinity's actual forecast debt structure (but notional gearing), as for (i) and (ii).

Financing cost risk results

In Table 8, we present our assessment of Affinity's financing cost RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the financing cost risk range from Affinity's Business Plan (risk under Affinity's BP),[33] and Ofwat's view of financing risk at Draft Determinations (Ofwat's view of DD risk), for comparison.

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[32] Please see: '*Ofwat's draft determination increases sector risk*' Moody's (14 August 2024)
[33] Please see: '*AFW20: RoRE risk ranges (Economic Insight)*', Economic Insight (September 2023), page 18.

Table 8: Financing cost RoRE risk range

	Risk under Affinity's BP	Ofwat's view of DD risk[34]	DD risk	Risk under Affinity's Representations
P10	-0.28%	-0.42%	-1.85%	-1.79%
P50	N/A	N/A	-0.18%	-0.02%
P90	0.46%	0.90%	1.51%	1.78%

Sources: Economic Insight analysis, 'PR24 draft determinations: Aligning risk and return appendix', Ofwat (2024), pages 20-21, and 'RoRE risk at PR24', Economic Insight (2023), page 18.

As shown, under Ofwat's Draft Determinations, between -1.85% (P10) and 1.51% (P90) of Affinity's RoRE could be at risk due to financing costs at PR24. This range is wider and more negatively skewed than Ofwat's view, reflecting differences in expectations of the volatility of inflation rates and of the actual cost of new debt. Should Affinity's Representations be accepted in full, the range would shift upwards to be symmetrical at -1.79% (P10) to 1.78% (P90). This is largely due to the proposed increase in the allowed cost of new debt, which would make the risk of raising new debt more symmetrical.

We should note that, under Affinity's Representations, Affinity is proposing a WACC of 4.23%.

In the remainder of this chapter, we detail the methodology used to arrive at these results, along with any changes to our methodology since our analysis of risk under Affinity's Business Plan.

5B. Details of our methodology

We estimate a risk range for financing costs in the following steps:

a. **We start by estimating the 10th and 90th percentiles and most likely values of the parameters determining the cost of debt** for each of the three risk areas: (i) inflation risk on fixed-rate debt is determined by CPIH inflation; (ii) inflation risk on index-linked debt is determined by the RPI-CPIH wedge; and (iii) the risk of raising new debt is determined by Affinity's likely actual cost of new debt. Our method for estimating each of these parameters is explained in more detail below.

   – We estimate the 10th percentile, 90th percentile, and most likely (calculated as the mean) CPIH inflation rate based on the last 10 years of outturn data (2014–2023) as published by the ONS.[35] We find that CPIH inflation was 0.94% in the 10th percentile and 6.91% in the 90th percentile.

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[34] *Ofwat reports a combined post-tax risk range including both financing costs and revenue risk. To be consistent with this, we restate the pre-tax risk range Ofwat reports for financing costs only on a post-tax basis.*

[35] *Please see https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l55o/mm23.*

– Similarly, we estimate the 10th percentile, 90th percentile, and most likely (calculated as the mean) wedge between RPI inflation and CPIH inflation based on the last 10 years of outturn data (2014–2023) as published by the ONS.[36, 37] We find that the RPI-CPIH wedge was 0.59% in the 10th percentile and 2.98% in the 90th percentile.

– Regarding Affinity's actual cost of new debt, we use Ofwat's risk analysis as a starting point. This analysis suggests that water companies can issue debt at rates between 59bps higher (P10) and 94bps lower (P90) than the allowed cost of new debt (as indexed to the iBoxx 10+ A/BBB).[38] However, based on KPMG's view in the industry-wide project, we understand that Ofwat may not have taken into account the most recent developments in the debt markets, which suggest that the rates at which water companies can issue debt may have increased.

– We would prefer to conduct our own independent in-depth analysis of actual new debt costs to quantify this increase. However, due to limits on the time available for companies to respond to Ofwat's Draft Determinations, we rely on Affinity's understanding. We base our estimate on the proposal to increase the allowed cost of new debt by 39bps included in Affinity's Representations. This implies that actual new debt costs are likely 98bps higher (P10) to 55bps lower (P90) than the allowance under the Draft Determinations and 59bps higher (P10) to 94bps lower (P90) than the allowance under Affinity's Representations.

b. **Based on these parameters, we calculate the minimum, maximum, and most likely variance of actual debt costs** from (implied) debt cost allowances for each of the three types of debt. To this end, we first calculate the difference between the respective 10th and 90th percentiles and most likely values of the parameters estimated in step a and the benchmarks implied in the allowed cost of debt, that is: (i) the 2% long-run CPIH inflation assumption; (ii) the 0.9% RPI-CPIH wedge assumption; and (iii) the allowed cost of new debt. With regard to (iii), we use the allowance included in the Draft Determinations to calculate the 'DD risk' range and the allowance included in Affinity's Representations for our 'risk under Affinity's Representations' range. We then infer the minimum, maximum, and most likely variance based on the 10th and 90th percentiles and the most likely value using the methodology outlined in Section 8C.

c. **We then convert these minimum, maximum, and most likely variances in debt costs to their RoRE impact.** In line with Ofwat's approach in the Draft Determinations,[39] we implement the following calculation for each of the three risk areas:

$$RoRE\ impact = \Delta debt\ costs \times \%\ affected\ debt \times \frac{gearing}{1 - gearing} \times (1 - tax\ rate)$$

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[36] Please see https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/l55o/mm23

[37] Please see https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/czbh/mm23

[38] 'PR24 draft determinations: Aligning risk and return appendix', Ofwat (2024), page 20.

[39] 'PR24 draft determinations: Aligning risk and return appendix', Ofwat (2024), pages 19-21.

For example, for inflation risk on fixed-rate debt, '*% affected debt*' is the share of fixed-rate debt and '$\Delta debt\ costs$' is the difference between CPIH inflation and the 2% inflation assumption.

– We calculate the shares of (i) fixed-rate debt, (ii) index-linked debt, and (iii) new debt based on Affinity's forecast actual debt balances over AMP8. To inform our 'DD risk', we use the debt balances as per the Draft Determinations; for our 'risk under Affinity's Representations', we use the debt balances as per Affinity's Representations. In line with Ofwat, we make the simplifying assumption that all index-linked debt is linked to RPI for the purposes of estimating RPI-CPIH wedge risk.

– We assume 55% notional gearing[40] and a corporation tax rate of 25%.

d. **We aggregate the minimum, maximum, and most likely RoRE impacts of each of the three risk areas** as calculated in step c. by way of simple, additive aggregation. We do not use a Monte Carlo model here as we consider it plausible that Affinity's debt costs may be one of the extremes in each of the three areas simultaneously.

e. **We then construct a triangular distribution** from the minimum, maximum, and most likely RoRE impact of financing costs overall as calculated in step d. and, finally, calculate the P10 and P90 of the risk range for financing costs as the 10th and 90th percentile of this distribution.

5C. Changes to our approach since Business Plan submission

We have made the following changes to our calculations for estimating financing cost risk between Business Plan submissions and Draft Determinations:

• **As indicated above, we now include the risk associated with the RPI-CPIH wedge in our modelling**, in line with Ofwat's approach in the Draft Determinations.

• **We update the share of fixed-rate debt and the share of new debt** based on the debt balances included in the Draft Determinations and Affinity's Representations. Compared to the data used at Business Plan stage, the share of fixed-rate debt has increased, while the share of new debt has decreased. The former change has a widening, and the latter change a narrowing, effect on the risk range.

• **We use up-to-date inflation data**, which includes data for 2023 that was not yet available at the time of Business Plan submissions. The use of this data increases the potential upside of the risk range by increasing the P90 level of inflation.

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[40] *We note that, as outlined in Affinity's Representation, Affinity considers the appropriate notional gearing level to be 60%. We use 55% notional gearing for the purposes of the RoRE risk calculations for comparability with the Draft Determinations.*

- **We have improved the methodology for calculating new debt risk.** Our risk analysis begins from a consideration of Ofwat's own risk range for new debt risk, before we make alterations to arrive at a company-specific range for Affinity. Our method therefore begins by looking to understand the formula implemented by Ofwat to arrive at its cost of new debt risk range. While Ofwat had not published this formula in its Final Methodology, the regulator has provided more information in the Draft Determinations. We have revised the formula we use based on this. This has a widening effect on the risk range.

- **We have updated our view of the likely actual cost of new debt in light of recent increases in the rates faced by water companies.** The rates at which water companies issue debt have increased since Business Plans were submitted. This has led Ofwat to remove the downward adjustment of the benchmark index that was included in its early view in the Draft Determinations; and Affinity's Representations suggest that a further increase in in the allowed cost of new debt is necessary. We agree that it is important to take into account changes in the environment in which companies issue debt and have updated our view of the likely actual cost of new debt accordingly.

6 Outcomes risk

In this chapter, we present our assessment of the RoRE risk exposure from Outcome Delivery Incentives (ODIs) and Measures of Experience (MeX) for Affinity at PR24. Based on Affinity's historical performance, and supplemented with expert judgement, between -3.26% (P10) and -1.50% (P90) of Affinity's RoRE could be at risk at PR24, under Ofwat's Draft Determinations. While the resultant risk range narrows and shifts towards the upside, should Affinity's Representations be accepted in full (to between -1.19% (P10) and -0.20% (P90)). The design of the outcomes regime at PR24 embeds significant downside risk that we consider should be compensated through a higher allowed cost of equity.

6A. Introduction and overview of results

In this chapter we present our assessment of the risk Affinity faces as a result of ODIs and MeX over PR24, under both Ofwat's Draft Determinations, and should Affinity's Representations be accepted in full.

Context

The outcomes framework is designed to align the interests of companies and investors with those of their customers. ODIs work such that companies are exposed to penalties and rewards based on outturn performance relative to Performance Commitment Levels (PCLs), thereby incentivising companies to deliver 'good' performance for customers. ODI risk is therefore a function of Affinity's performance for each of its Performance Commitments (PCs) relative to the PCLs set, as well as Ofwat's ODI rates. At PR24, there will be 15 Common PCs that apply to all (water) companies, along with up to three Bespoke PCs, targeting the needs of a specific company's customers.[41]

Within these 15 Performance Commitments, Ofwat plans to include three measures of experience: (i) Customer measure of experience (C-MeX); (ii) Developer services measure of experience (D-MeX); and (iii) Business customer and retailer measure of

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[41] *'PR24 Draft Determinations: Delivering outcomes for customers and the environment'* Ofwat (July 2024), page 11.

experience (BR-MeX) – a new measure at PR24. At PR24, MeX payments will be calculated based on companies' relative performance to other firms in the industry (for D-MeX and BR-MeX), or companies' relative performance to a cross-industry benchmark (for C-MeX). Therefore, MeX risk is a function of both Affinity's own performance and the performance of other companies.

Approach

We primarily rely on historical data to calculate an ODI and MeX RoRE risk range. This is because for any individual outcome, performance is an extension of the performance in the previous year. Therefore, we would expect Affinity's past performance to be an appropriate indicator of future risk. For example, unplanned outage is unlikely to drastically change between years, as it is partially a function of company-specific factors that remain relatively constant over a short time horizon, such as the reliability of treatment works.

We acknowledge that efficiency gains and prior investments may make higher performance levels more achievable over time, so consider past performance *relative* to targets rather than in absolute terms, to account for these improvements. Of course, the usefulness of past performance relative to targets will depend in part upon whether the level of stretch of the targets set by Ofwat is consistent over time. A significant increase in the stretch of the targets for any individual PC between price control periods may result in the risk ranges calculated using this historical method being conservative.

Furthermore, we consider that company-specific factors are an important driver of performance on individual PCs. Therefore, we use Affinity-only historical performance rather than industry-wide performance, to capture Affinity-specific risk.

While this is our preferred approach, it is not feasible to robustly perform historical analysis for every PC. For certain PCs (e.g. water supply interruptions, unplanned outage etc.), we have only limited past performance data. Therefore, for these PCs, our historical analysis is supplemented with expert judgement of Affinity's likely performance over AMP8.

Overview of results and Affinity's Representations

In Table 9, we present our assessment of Affinity's outcomes RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the outcomes risk range from Affinity's Business Plan (risk under Affinity's BP),[42] and Ofwat's view of Affinity's outcomes risk at Draft Determinations (Ofwat's view of DD risk), for comparison.

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[42]   *Please see: 'AFW20: RoRE risk ranges (Economic Insight)', Economic Insight (September 2023), page 18.*

Table 9: Outcomes RoRE risk range (ODI and MeX)

	Risk under Affinity's BP	Ofwat's view of DD risk	DD risk	Risk under Affinity's Representations
P10	-3.11%	-3.45%	-3.26%	-1.19%
P50	N/A	N/A	-2.49%	-0.79%
P90	0.85%	2.42%	-1.50%	-0.02%

Sources: Economic Insight analysis, 'PR24 ODI risk – Monte Carlo payment consolidated', Ofwat (2024), 'PR24 draft determinations: Aligning risk and return appendix', Ofwat (2024), page 14, and 'RoRE risk at PR24', Economic Insight (2023), page 18.

As shown, we expect Affinity's outcomes risk to be between -3.26% (P10) and -1.50% P90 under Ofwat's Draft Determinations. Although the magnitude of this range is similar to Ofwat's view of risk at DDs, we expect Affinity's risk range to be far more negatively skewed. We consider that this negative skew is a function of the following:

- **The removal of caps, collars, and deadbands on certain PCs**. Ofwat will use caps and collars on a limited basis for individual Performance Commitments and proposes the removal of deadbands on all but one PC.[43] This increases the exposure of companies to significant levels of underperformance on individual PCs.

- **A reduction in the number of Bespoke PCs at PR24.** Companies historically have been more likely to underperform on common PCs, but have tended to outperform on Bespoke PCs. In previous price controls, this had the effect of balancing out the rewards and payments received on ODIs. Affinity has only a single Bespoke PC in Ofwat's Draft Determinations – Low pressure, which is penalty-only, so offers no chance of outperformance.

- **The presence of penalty-only incentives.** Some PCs, such as the Compliance Risk Index (CRI) PC, offer no possibility of outperformance under Ofwat's methodology, with targets set at the maximum achievable level. But, since there is a nonzero chance of underperforming, the expected payments for these PCs, and therefore the overall payment distribution, are skewed to the downside. There are no reward-only incentives that would work to balance this.

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[43]   *Compliance risk index.*

- **More generally, the scope for large underperformance is greater than that of large outperformance for several PCs.** Historically, Affinity has not consistently underperformed on all PCs in a single year. Instead, Affinity has outperformed on some and underperformed on others. However, the magnitude of the underperformance on PCs where Affinity has missed its targets has generally been larger than the magnitude of outperformance on PCs where Affinity has hit its targets. There are a couple of potential reasons for this:

  (ii) Underperformance might be more susceptible to shocks that impact performance (e.g. extreme weather) compared to outperformance; and

  (iii) Large increases in performance might be hard to achieve, particularly for PCs with targets set near, or at the upper bound of feasible performance, such as serious pollution incidents.

Therefore, in its Representations, Affinity has proposed several risk mitigation measures to reduce its outcomes risk exposure. Specifically, Affinity proposes the following changes.

- Affinity has re-calculated ODI rates for all but two[44] Common PCs. These rates are lower than the rates Ofwat calculated at Draft Determinations.

- Affinity proposes to limit the risk associated with Per Capita Consumption (PCC). Under the Draft Determinations, PCC is Affinity's single greatest source of outcomes-related risk; we calculate a PCC-specific RoRE risk range of between -1.39% (P10) and -0.28% (P90), which is both the widest and most negatively skewed risk range out of all outcome measures. Therefore, Affinity has proposed:

  – a cap and collar on PCC, set at ±0.4% RoRE, in line with Ofwat's allocation of RoRE to this PC from its collaborative customer research;[45]

  – a revised PCL, aligning with that proposed in the Business Plan; and

  – a deadband on PCC equal to the dry year level (which includes a corresponding outperformance deadband to provide equal customer protection).

- Affinity proposes to reduce the thresholds of the outcomes aggregate sharing mechanism. Specifically, the aggregate sharing mechanism will be set at ±1% RoRE in the first instance, at which point payments will be shared 50:50 with customers. A secondary threshold will apply at ±3%, where additional payments will be shared 10:90 between companies and customers.

- Affinity proposes to remove the low pressure Bespoke PC and to introduce a Bespoke PC for embedded greenhouse gas (GHG) emissions.

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[44]   *Biodiversity and operational greenhouse gas emissions (water).*
[45]   *'Using collaborative customer research to set outcome delivery incentive rates', Ofwat (August 2023), page 44.*

As a result of these mitigations, our calculated risk range for Affinity on outcomes, should these Representations be accepted in full, reduces to between -1.19% (P10) and -0.20% (P90) of Affinity's RoRE.[46] Although still negatively skewed (as a result of the key reasons set out above), the reduction in magnitude of this risk range significantly reduces the negative skew of Affinity's overall risk range at Representations.

In the remainder of this chapter, we detail the methodology used to arrive at these results, considering: (i) our methodology for calculating risk for individual PCs; (ii) our methodology for calculating risk for each MeX; (iii) how we aggregate risk for individual PCs into a single outcomes risk range; (iv) and finally, any changes in our approach compared to that taken at Business Plan stage. At the end of this chapter, we also provide a detailed breakdown of the risk ranges for each PC under Ofwat's Draft Determinations and should Affinity's Representations be accepted in full.

6B.   Details of our methodology for calculating ODI risk

In order to construct a risk range for ODIs, we consider the RoRE risk for each PC, and then aggregate each risk range to produce an overall range. To construct a risk range for each individual PC, we follow these steps:

a.   **Estimate the minimum, maximum and most likely level of performance** in each year of AMP8. Depending on the availability of historical data, we use one of three methods; these are outlined in more detail below.

b.   **Calculate a triangular distribution of performance**, based off the performance parameters from step a. The minimum, maximum, and most likely performance levels are taken as inputs to generate a triangular distribution of performance for each year of AMP8.

c.   **Calculate the financial penalties or rewards** associated with the performance levels from the triangular distribution. This is calculated as the difference between the expected performance (from the distribution) and the PCL, multiplied by the ODI rate. To calculate the 'DD risk', the PCLs and ODI rates from Ofwat's Draft Determinations are used. In its Representations, Affinity has proposed a change to the PCL for PCC. This PCL is used alongside the remaining PCLs from the Draft Determinations for the 'Affinity's risk under its Representations'. Affinity also proposes updated ODI rates in its Representations; these are included accordingly in the latter risk range.

–   For PCs with a deadband, we use the deadband instead of the PCL in the calculation of payments. To calculate the 'DD risk', we apply the underperformance deadband for the Compliance risk index as included in the Draft Determinations. To calculate risk in the scenario that Affinity's Representations are accepted in full, we further apply a symmetric deadband for PCC, as per the Representations.

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[46]   *Note that in addition to these mitigations, we calculate this risk range based on Affinity's Representations RCV, which could explain a small part of the difference between the 'DD risk' and the 'Risk under Affinity's Representations'.*

- For PCs with enhanced incentives, we add a further outperformance payment calculated using the below formula, if the expected performance level exceeds the enhanced threshold included in the Draft Determinations. To calculate the 'DD risk', we use the enhanced outperformance rates as included in the Draft Determinations. To calculate risk in the scenario that Affinity's Representations are accepted in full, we use an enhanced outperformance rate of twice the ODI rate proposed in the Representations.

$$(exp.\ performance - enhanced\ threshold) \times (enhanced\ rate - ODI\ rate)^{[47]}$$

d. **Convert the financial penalties or rewards to % RoRE terms** using Affinity's forecast RCV along with 55% notional gearing.[48] To calculate Affinity's risk at Draft Determinations, we use the RCV figures published in Ofwat's Draft Determinations. To calculate risk in the scenario that Affinity's Representations are accepted, we use the RCV figures from Affinity's Representations.

e. **Apply caps and collars**, where appropriate. To calculate the 'DD risk', we use the caps and collars included in Ofwat's Draft Determinations. To calculate risk in the scenario that Affinity's Representations are accepted in full, we also include a further cap and collar on PCC, as per the Representations.

Methods for constructing a probability distribution of performance

As set out above (in step a.), we use one of three methods to the minimum, maximum and most likely expected performance over AMP8, for each PC. In this section, we describe each of these methods, and where they are used.

Method 1: historical data only

Method 1 Overview

Used for the following PCs: Customer contacts about water quality; Serious pollution incidents; Repairs to burst mains.

Rationale: These PCs have at least 9 years of historical outturn data. Therefore, we believe that historical data alone is sufficient to construct a robust view of performance on each of these PCs.

For PCs where we use Method 1, we estimate the minimum, maximum and most likely performances using historical data. To do so, we calculate the percentage of under- or outperformance relative to the PCL for Affinity in each year for which data is available. Yearly data is used as most ODI payments are 'in-period' – they will get recovered from each company every year during AMP8.[49] We then take the minimum, maximum and

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[47] *This payment is in addition to the outperformance payment at the standard ODI rate; that is, performance beyond the enhanced threshold will attract payments at the enhanced rate in total.*

[48] *We note that, as outlined in Affinity's Representation, Affinity considers the appropriate notional gearing level to be 60%. We use 55% notional gearing for the purposes of the RoRE risk calculations for comparability with the Draft Determinations.*

[49] *See for example:, In-period ODI determinations, Ofwat. Accessed on 13/08/24.*

most likely (calculated as the mean) performance level from this, also as a % of the PCL. These percentages are then applied to the PCLs for AMP8 to calculate the expected minimum, maximum and most likely performance.[50] To construct the view of risk under the Draft Determinations, we use the PCLs set out by Ofwat in the Draft Determinations; and to construct the view of risk under Affinity's Representations we update the PCC PCL to that submitted under Affinity's Business Plan.

Method 2: weighted average of historical data and expert judgement

Method 2 Overview

Used for the following PCs: Water supply interruptions; Compliance risk index; Leakage; PCC; Business demand; Discharge permit compliance; Unplanned outage.

Rationale: These PCs have either (i) less than 5 years of outturn data; or (ii) were not targeted in previous years, whether through ODIs or other mechanisms (e.g. EPA targets). This means that a robust risk range cannot be constructed using historical data alone, so our historical analysis is supplemented with expert judgement. Note that while Leakage and PCC have been incentivised from PR14 onwards, it is only since PR19 that these incentives have applied to a three-year-average. Therefore, we consider that historical data alone is insufficient to calculate a risk range.

Method 2 follows the same approach as Method 1 regarding calculating expected minimum, maximum and most likely performances from historical data.[51, 52] However, under Method 2, these expectations based on historical data are supplemented by expert judgement. Below, we set why and how we include expert judgement alongside historical data in this method.

Why do we use expert judgement?

- Historical data is preferred as an indicator of future performance, since it represents the performance levels that Affinity has actually achieved.

- However, in this situation, historical data is either limited in terms of: (i) the number of data points; or (ii) its relevance to future performance – as performance on PCs that have not previously been incentivised might not represent the performance a company could achieve if was financially motivated. Therefore, historical data alone is insufficient to produce robust estimates of performance for these PCs.

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[50] *As the PCL for AMP8 is zero for serious pollution incidents, we calculate the historical minimum, maximum and mean deviation from the PCL in absolute terms and apply these absolute differences to the PCL for AMP8.*

[51] *For the compliance risk index (the only PC with a deadband under the Draft Determinations), we calculate historical performance relative to the deadband rather than to the PCL, and then apply this percentage to the AMP8 deadband.*

[52] *For PCC and leakage, the PCL was set on an annual basis at PR14, but has been set as a three-year trailing average since PR19. To ensure comparability with what is being incentivised at PR24, we convert all historical data to three-year trailing averages for the purpose of our calculations.*

- Industry experts at Affinity Water have provided us with their view of the 10th percentile, 90th percentile, and 'most likely' performance levels for Affinity on each PC. These experts have internal visibility of Affinity's business so are able to produce realistic performance estimations.

How we use expert judgement

- Despite the drawbacks of historical evidence for these PCs, they do still provide some indication of likely performance. Therefore, we use a weighted average of historical analysis and expert judgement to generate our performance distributions.

- We use a 2/3 weighting on historical analysis for these PCs and 1/3 weighting on expert judgement, which reflects our view of the relative strength of these two sources of evidence.

- In practice, this involves determining the minimum, maximum, and most likely performance level separately using historical analysis and expert judgement, and then using a weighted average to construct the triangular distributions are generated.

  – We estimate the respective performance levels based on historical analysis in the same way as under Method 1.

  – To calculate the respective performance levels based on expert judgement, we use the most likely performance level as stated by the experts and infer the minimum and maximum from the 10th and 90th percentiles using the method described in Section 8C.

Affinity's Representations have not changed its view of expected performance. Therefore, the expert judgement used is identical in our 'DD risk' range, and our 'risk under Affinity's Representations' range.

Method 3: expert judgement only

Method 3 Overview

Used for the following PCs: Operational greenhouse gas (GHG) emissions; Biodiversity; Low pressure; Embedded greenhouse gas emissions.

Rationale: These PCs are new at PR24. Therefore, there is no historical data that we can use in our analysis, so expert judgement alone is used to construct risk ranges for these PCs. All Bespoke Performance Commitments are modelled using this method, since no historical Bespoke PCs are proposed by either Affinity or Ofwat.

The process for establishing a risk range for PCs under method 3 follows the same process as method 2, except that the weighting on expert judgement is set to 100%. This results in expected minimum, maximum, and most likely performance levels for each PC that are entirely constructed from expert judgement.

In its Business Plan, Affinity proposed three Bespoke PCs: low pressure, whole life carbon, and abstraction incentive mechanism. At Draft Determinations, Ofwat accepted the low pressure PC, rejecting Affinity's other Bespoke PCs. Therefore, to model risk under the Draft Determinations for Affinity, we do not model risk for Bespoke PCs other than low pressure.

In its Representations, Affinity proposes removing the low pressure PC, and introducing a PC for embedded greenhouse gas emissions. Therefore, to model Affinity's risk under its Representations we model embedded greenhouse gas emissions as the only Bespoke PC.

6C.   Details of our methodology for calculating MeX risk

In its Draft Determinations, Ofwat has set out in more detail how its three measures of experience will be applied. Based on this information, we model risk separately for each MeX at PR24. C-MeX and D-MeX were previously used in AMP7, so model risk based on a historical analysis of past performance, (although we note the limitations of our analysis here, since the calculation method has changed significantly between price controls). BR-MeX is entirely new at PR24, so we take a top-down approach to modelling risk for this MeX, based on Ofwat's target incentive range.

C-MeX and D-MeX risk

To construct a risk range for C-MeX and D-MeX we undertake the following steps:

a.   **Calculate Affinity's minimum, maximum, and most likely performance levels** on each MeX, based on historical data. This is equivalent to calculating the minimum, maximum, and most likely C-MeX/D-MeX scores for Affinity.

   – We assume that Affinity's most likely score in AMP8 is its average performance in the past (i.e. in AMP7 and the 2019-20 shadow year). Therefore, we calculate Affinity's average score over the time period for which there is data (2019-2024). Yearly data is used rather than data at a price control level, because the MeX scores and incentive payments were determined yearly in AMP7.

   – We assume that Affinity's minimum and maximum possible scores are the average industry minimum and maximum scores in the past. Therefore, we calculate the average of the lowest (highest) industry scores across each year for which there is data. We use industry-wide scores rather than Affinity-only scores here for two reasons: (i) since there are only five years of data, it is unlikely that Affinity's past scores alone represent the full range of feasible scores for Affinity's in AMP8, and (ii) it is feasible that Affinity could be either the best or worst performing firm in a single year of AMP8.

b.   **Create a triangular distribution of MeX scores for each MeX**, using the parameters calculated in the previous step.

c. **Calculate the upper, lower, and target benchmarks for each MeX**, based on historical data. These benchmarks are required for the calculation of MeX payments, in step d. below.

– For C-MeX, these benchmarks are the UKCSI upper quartile, minimum, and average scores. Ofwat reports these scores for 2020-24; we calculate the forecast benchmarks for AMP8 as the average of these four available years.

– For D-MeX, these benchmarks are the industry maximum, minimum, and median D-MeX scores. The industry maximum and minimum scores have already been calculated in step a., and the overall industry median is calculated as the average industry median across the five years of data.

d. **Convert the values of the triangular distribution for each MeX from scores to penalty/reward payments.** Using the figures calculated in the previous steps, we convert the performance distribution to a payment distribution (in % RoRE) according to the formulas below, where the *score* is Affinity's MeX score from the performance distribution, and *target, upper benchmark, and lower benchmark,* refer to the benchmarks calculated for each MeX at step c.. The *RoRE allocation* is set at 0.5% for C-MeX and at 0.25% for D-MeX, as per the Draft Determinations.[53]

(i) if $score > target$: $\dfrac{score - target}{upper\ benchmark - target} \times RoRE\ allocation$

(ii) if $score < target$: $\dfrac{score - target}{lower\ benchmark - target} \times RoRE\ allocation$

(iii) if $score = target$: 0

BR-MeX risk

To model BR-MeX, we use a top-down approach. This is because BR-MeX is a new measure of experience at PR24, so there is no existing historical data on which we can base our analysis. In its Draft Determinations, Ofwat plans to ensure that BR-MeX equates to approximately ±0.2% RoRE. Therefore, we construct a distribution of BR-MeX performance for Affinity at PR24 with a minimum value of -0.2% RoRE and a maximum value of +0.2% RoRE.

Given the lack of past performance information, we have no reason to believe Affinity is more likely to perform at any one point in the range defined by the RoRE allocation. Therefore, we assume that BR-MeX penalties/rewards are uniformly distributed.

6D.   Aggregating our results

To combine the risk ranges for each PC and MeX into an overall outcomes risk range, we take the following approach:

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[53] *'PR24 draft determinations: Outcomes – Measure of experience performance commitments appendix'* *Ofwat (2024), pages 19 and 27.*

- **We first aggregate the RoRE risk range for each PC and MeX using a Monte Carlo model.** This is because it is unlikely that a company performs at the extremes on all PCs and MeX concurrently. Further details of our approach to, and rationale for, using Monte Carlo simulations can be found in Chapter 8.

- **Next, the aggregate sharing mechanism is applied.** This mechanism provides protection to both customers and companies from instances of very high outperformance or underperformance. Overall payments related to outcomes (including both ODIs and MeX payments) will be reduced once certain thresholds are met.

    - In its Draft Determinations Ofwat set a threshold at ±3% RoRE, at which point payments are shared 50:50 with customers. A secondary threshold applies at ±5% RoRE, after which any further payments are shared at a ratio of 10:90 between companies and customers.[54] We use these thresholds for our calculating of the 'DD risk' range.

    - To calculate risk should Affinity's Representations be accepted in full, we use Affinity's new proposed sharing thresholds: at ±1% RoRE, payments are shared 50:50 with customers, and at ±3% RoRE, payments are shared at a ratio of 10:90 between companies and customers.

    - The sharing rate is applied to the output distribution of the Monte Carlo, reducing the extremes of the distribution.

- **Finally, Affinity's outcome risk range, measured as a % RoRE can be derived**. Taking the 10th and 90th percentiles of this post-ASM, post-Monte Carlo distribution produces the P10 and P90, given as -3.26% and -1.50% respectively under the Draft Determinations, and as -1.19% and -0.20% under Affinity's Representations.

6E.   Changes to our approach since Business Plan submission

We have made the following changes to our calculations for estimating outcomes risk between Business Plan submissions and Draft Determinations:

- **We now include MeX payments in the aggregate sharing mechanism.** At Draft Determinations, Ofwat stated that MeX will be included within the outcomes aggregate sharing mechanism. This was not in Ofwat's Final Methodology, so at Business Plan submissions, we aggregated ODI risk and MeX risk separately, applying the aggregate sharing mechanism to ODI risk alone.

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54   *'PR24 Draft Determinations: Delivering outcomes for customers and the environment', Ofwat (July 2024), page 35.*

- **Additional historical data is now available**. Since Business Plans, a further year of outturn data on some Performance Commitments has been published (2023/24). This was not included in Affinity's Business Plan range, but has been included in our calculation of Affinity's risk at Draft Determinations, and under its Representations.

- **We improved our use of historical data for PCC and leakage.** To calculate risk under Affinity's Business Plan, we used historical data on an annual basis for AMP6, as the incentive at the time was set on an annual basis. We now use AMP6 data restated as a three-year trailing average, as the incentive going forward will be set on this basis. We consider this latter approach more informative for a forward-looking view of risk: in particular, a single year of atypical performance will have a smaller impact on penalty or reward payments in AMP8 than it would have had in AMP6. Under this revised approach, we now consider it appropriate to supplement historical analysis with expert judgement for these two PCs.

- **We use updated performance forecasts**. Affinity have revised its expectations of likely outturn performance for each ODI at PR24. Therefore, although the approach to using expert judgement in our methodology has remained the same, the expert judgement figures have changed since Business Plans.

- **We use industry-wide (rather than Affinity-specific) past performance for C-MeX and D-MeX,** to calculate the minimum and maximum feasible performance levels for Affinity.

  Previously, the minimum and maximum level of performance attainable for Affinity (on C-MeX and D-MeX) was calculated based on Affinity-only past performance. The argument for this method is that Affinity's past performance with regards to these incentives may provide the best indicator of its forward-looking risk.

  However, it is also arguable that, given that we are limited to observing only five years of past performance, this does not represent the full range of potential performance for Affinity. In addition, given that the MeX incentives are based on relative rankings, it is plausible that Affinity may rank anywhere from first to last place. Therefore, we have modified our method in line with the above, assuming that the worst (best) Affinity can do on C-MeX or D-MeX is be the last placed (first placed) firm in each year of PR24.

- **C-MeX and D-MeX are modelled based on Ofwat's Draft Determination methodology**. At Business Plans, Ofwat had not yet finalised its method for calculating C-MeX and D-MeX payments. Therefore, we calculated risk based primarily on the PR19 MeX methodology. Ofwat has since provided more information on how these incentives will be calculated at PR24, so this has been included in our updated methodology.

- **Our approach to constructing triangular distributions has been modified**. As with several other risk areas, at Business Plans, we used a different method to construct triangular distributions from historical data. This change is explained in more detail in Chapter 8.

6F.   Individual ODI and MeX risk results

In the figures overleaf, we present the individual risk ranges for each PC and MeX, first under Ofwat's Draft Determinations, and second should Affinity's Representations be accepted in full.
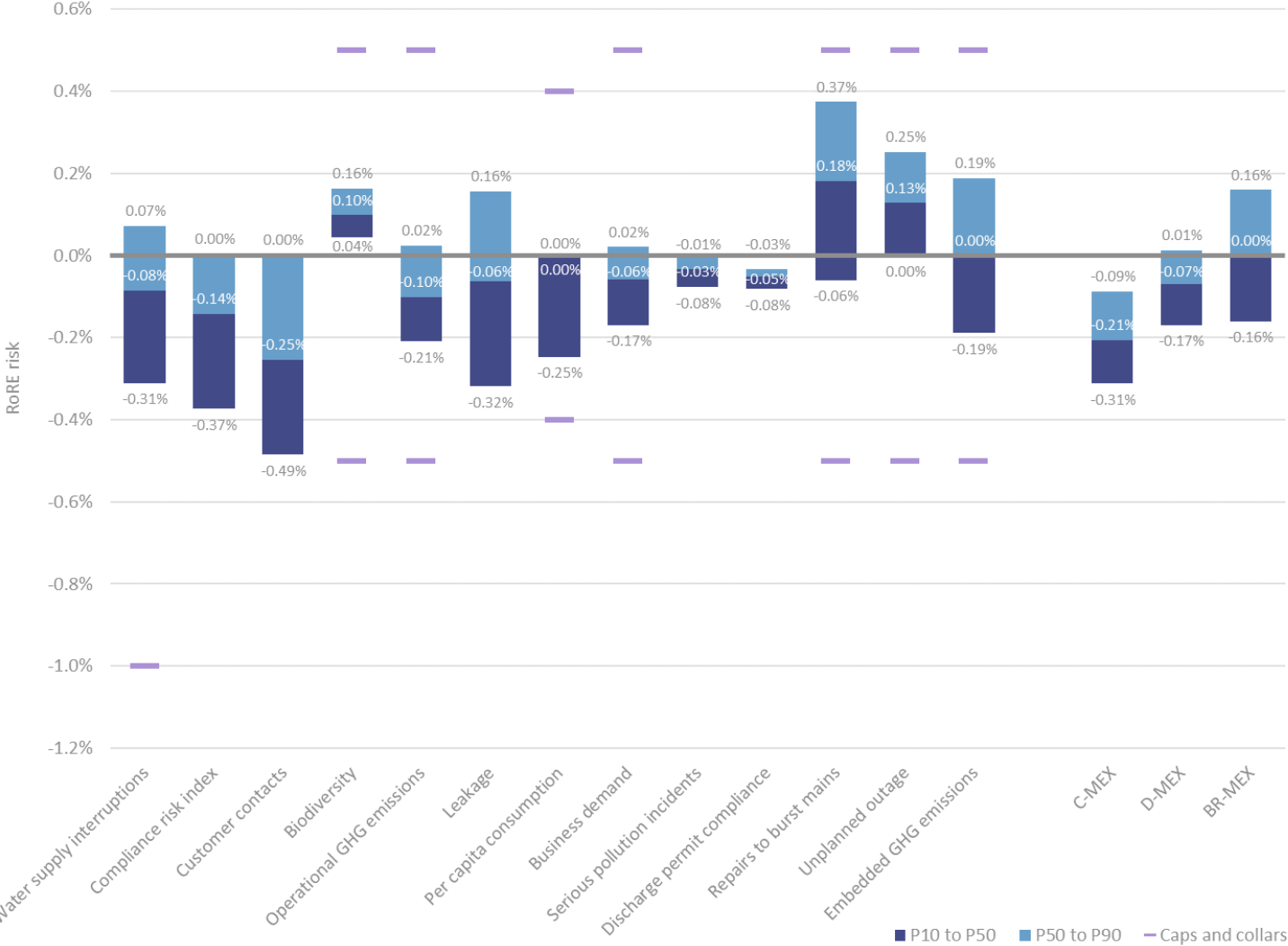
Figure 1: RoRE risk by PC under the Draft Determinations
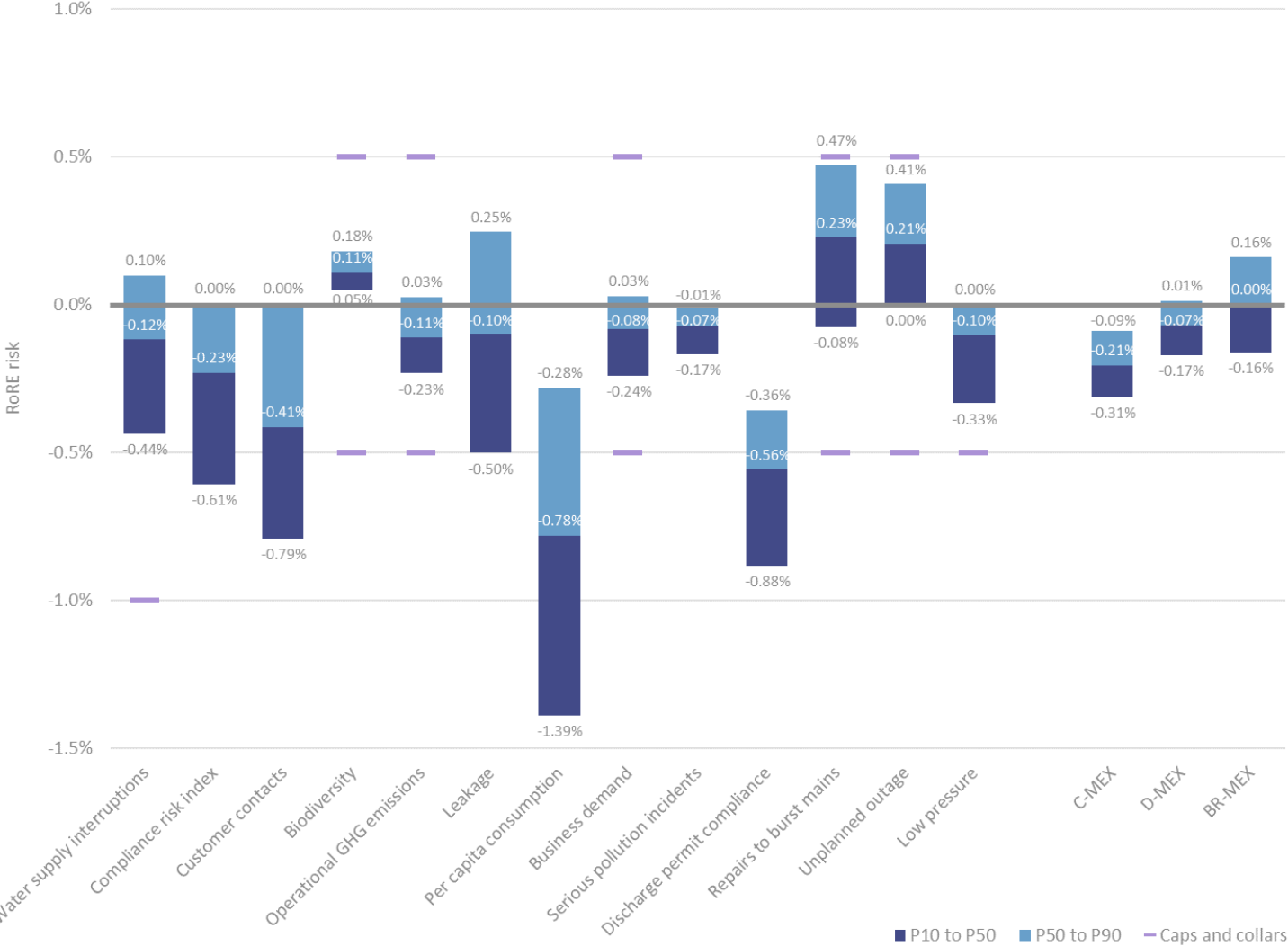
Source: Economic Insight analysis

Figure 2: RoRE risk by PC should Affinity's Representations be accepted in full

Source: Economic Insight analysis

7   PCD risk

In this chapter, we present our assessment of the RoRE risk exposure resulting from Price Control Deliverables (PCDs) for Affinity at PR24. Based on our analysis using the Cornerstone construction delay dataset, between -1.39% (P10) and -0.43% (P90) of Affinity's RoRE could be at risk at PR24, under Ofwat's Draft Determinations. Should Affinity's Representations be accepted in full, this increases to between -1.73% (P10) and –0.46% (P90). This is because, although the likelihood of delay and non-delivery is expected to have decreased, in light of Affinity's requested increased allowance, the associated penalty rates in the event of delay will increase.

7A.   Introduction and results summary

In this chapter we present our assessment of the risk Affinity faces as a result of PCDs, under both Ofwat's Draft Determinations, and should Affinity's Representations be accepted in full.

Context

Ofwat has introduced Price Control Deliverables as a new form of incentive mechanism at PR24. PCDs return allowances to customers in the event that Ofwat considers a funded improvement is not delivered, or, in some cases, if it is delivered late.

Ofwat appears to have two main objectives for PCDs; (i) to *incentivise* companies to deliver 'funded' investment schemes – i.e. investments for which Ofwat considers it has granted funding; and (ii) to *protect customers* from paying for investments which Ofwat considers have not been delivered, or delivered late.

As a result, Ofwat aims to ensure that companies will be worse off if they fail to deliver the total funded improvement within AMP8. Specifically, if companies fail to deliver improvements, then the PCD payment (together with any related ODI payment) requires firms to return to customers *more* than the allowed cost of the funded improvement.

PCD incentives come in two forms at PR24: (i) time incentive payments; and (ii) non-delivery payments. Time incentives will reward "early" or "timely" delivery and penalise late delivery. Non-delivery payments will return funds to customers in the event of non-delivery. Therefore, the PCD risk is a function of a company's ability to deliver the PCD units on time, and within the AMP.

Approach

Due to the nature of PCDs being newly introduced in PR24, we have not been able to draw on any historical PCD data in our analysis. As a result, we have drawn upon third-party data from Cornerstone.[55] This data reveals the distribution of delay durations (as a percentage of forecasted duration) which have occurred in projects in the construction industry. Specifically, in 2022, professionals in the UK construction industry were asked to complete a survey about their experiences of delays in major construction projects. The survey found that delays impacted over 85% of those in the construction industry, leading to longer delivery times.

We have limited information regarding which firms were included in the survey and therefore, are not able to assess whether they are appropriate comparator firms to the water industry, and Affinity specifically. The survey does, however, provide information on the reasons for the reported construction delays. 'Poor/unrealistic planning' was reported as the most significant reason, followed by: resource issues; information issues; changes to specifications; resource productivity; finance hold-ups; and the weather. We expect similar contributing factors to lead to delays and delivery challenges in enhancement projects in the water industry.

This data is used to construct a distribution of likely performance for each PCD included in Ofwat's Draft Determinations, that applies to Affinity. From this, we model the PCD penalties Affinity would incur at different levels of performance, by applying Ofwat's PCD methodology. In doing so, we model both the risk associated with late delivery, and the risk associated with non-delivery of funded improvements.

Overview of results and Affinity's Representations

Below, we present our view of Affinity's PCD RoRE risk range, under the following scenarios: (a) Ofwat's Draft Determinations (DD risk); and (b) should Affinity's Representations be accepted in full (risk under Affinity's Representations).

These ranges are presented alongside the PCD risk range from Affinity's Business Plan (risk under Affinity's BP),[56] and Ofwat's view of Affinity's PCD risk at Draft Determinations (Ofwat's view of DD risk), for comparison. A breakdown of the individual PCD risk ranges (prior to Monte Carlo aggregation) is set out in Section 7D.

We note that the PCD risk range we present includes **both** non-delivery and time incentive risk. This deviates from Ofwat's guidance of including the risk of non-delivery in the totex risk range. We consider that it is important to review the risk that PCDs

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[55] 'Delays in the Construction Industry: 2022 Survey'. Cornerstone (January 2023). Available here: Cornerstone.

[56] Please see: 'AFW20: RoRE risk ranges (Economic Insight)', Economic Insight (September 2023), page 18.

introduce into the regulatory framework in the round, and by reporting only time incentive risk for PCDs, the scale of the impact would be understated.

Table 10: PCD RoRE risk range using Monte Carlo aggregation

	Risk under Affinity's BP	Ofwat's DD view	DD risk	Risk under Affinity's Representations
P10	-1.68%	-0.17%[57]	-1.39%	-1.73%
P50	N/A	N/A	-0.58%	-0.59%
P90	-0.54%	0.17%	-0.43%	-0.46%

Source: Economic Insight analysis, and Ofwat's DD PCD risk range model: https://www.ofwat.gov.uk/wp-content/uploads/2024/08/Risk-ranges-for-PCD-model-.xlsx , accessed on 21/08/24.

As shown, our analysis suggests that between -1.39% and -0.43% of Affinity's RoRE is at risk at PR24 from PCDs, which includes both risk from late delivery and non-delivery. This risk is highly negatively skewed, as a result of the presence of penalty-only non-delivery payments, and asymmetrical time incentive payments (with the reward rate being ¼ of the penalty rate).

We consider that this risk is conservative, because while our modelling allows us to estimate the likelihood of incurring PCD penalties, it does not factor in the additional unintended costs that we consider PCDs add to the regulatory framework, including: (i) additional totex risk owing to allocative inefficiency, through limiting the flexibility of companies to deliver outcomes using the method they fit; and (ii) additional financing cost risk through lowering the expected return for companies.

Should Affinity's Representations be accepted, our analysis suggests that the risk range on PCDs would widen to between -1.73% and -0.46% of RoRE. This is largely a result of the following changes:[58]

- Affinity has requested higher expenditure allowances for projects with an associated PCD under its Representations. This has two competing effects on our view of PCD risk:

  - Higher allowances reduce the risk of non-and late delivery, since companies have additional resources available to enable them to meet their delivery targets.

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[57] *Ofwat's RoRE risk range for Affinity considers risk from time incentives only.*
[58] *We note that Affinity has also proposed to introduce an additional PFAS PCD, referred to as "PFAS – Additional Business Case", however this does not impact our results.*

– Higher allowances increase the amount of expenditure that is at risk from late or non-delivery penalties. This means that the magnitude of the penalty companies *could* incur from failing to meet PCD targets (and therefore associated risk) is higher at Representations than at Draft Determinations.

Based on our analysis of the increase in allowances that Affinity has included in its Representations, the latter effect outweighs the former, increasing the extent of the downside risk.

• Affinity has proposed an alternative delivery profile for the Mains renewals PCD. This reduces the risk associated with Mains renewals, since Affinity expects there to be a higher likelihood that it is able to successfully this new delivery profile on time.

In the remainder of this chapter, we provide details on the methodology used to arrive at the results presented above and how this has changed from our range calculated at Business Plans.

7B. Details of our methodology

In order to construct a risk range for PCDs, we first: (i) calculate the expected delivery distribution for each PCD; and then (ii) convert this into payments, and ultimately, a % RoRE. This is explained in more detail below.

Calculating the delivery distribution

We calculate a delivery distribution for each PCD, which reflects our view of the expected delivery against PCD targets in each year. We do this using Cornerstone data of delays to construction projects in the UK. The steps we take here are as follows:

a. **We first convert the Cornerstone data on project delays into a usable form.**

– The Cornerstone data was reported in grouped intervals of 10%. For example, a delay was reported as a "1% - 10% delay" rather than the specific delay percentage. We made the assumption that each observation in the respective intervals was equal to the midpoint of that interval. Therefore, in our example, all observations reported as "1% - 10% delay" were converted to a 5.5% delay.

– We convert the Cornerstone data from duration of delay (% of projected duration) to delivery rate. For example, if a five-year project experiences a delay of 20% then it will take 1.2 times as long (120% of forecast project duration) to deliver the same amount of units and therefore only 83% of the forecasted units will be delivered in the five-year period.[59] We set out the formula to convert the delay duration to the delivery rate below.

$$Delivery\ rate = \frac{1}{1 + delay\ duration\ \%}$$

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[59]   *It is worth noting that a 20% delay does <u>not</u> equal a delivery rate of 80%.*

b. We then interpret the calculated delivery rate in one of two ways, depending on the nature of the project in question.

- For some PCDs, we believe that delivery is binary (i.e. partial delivery is not possible). For instance, in relation to the supply interconnector PCD, when building a supply interconnector, companies can feasibly only deliver 100% or 0% of the funded improvement – a partially complete supply interconnector delivers no benefits. Therefore, for such PCDs, we interpret our delivery rate as the *probability* that the improvement is delivered during the price control, rather than the *proportion* of the PCD delivered.

- For other PCDs we believe partial delivery is possible (e.g. number of smart meters delivered). Therefore, we interpret the delivery rate as the *proportion* of the PCD target that will be delivered over the price control.

- In practice, for the purposes of our modelling, we model Supply Interconnectors as a binary PCD, and model other PCDs under the assumption that partial delivery is possible. We acknowledge that aspects of the delivery of other PCDs could also be binary, but due to the complexities around the nature of delivery, it has not been possible to capture this in our analysis.

In our analysis, we consider that all units or schemes not delivered by the end of the AMP will incur non-delivery payments. While we acknowledge that Ofwat may in some circumstances waive the non-delivery penalty if companies are on track to deliver early in the following AMP, charging "late delivery" penalties instead, we have little information on how this process will work. Therefore, this is excluded from our analysis.

c. Next, we use the Cornerstone data to construct a distribution of performance for each PCD in terms of either (a) the percentage of the target delivered in each year (for most PCDs); or (b) the probability of delivery occurring (for Supply Interconnectors).

- **For PCDs where partial delivery is possible**, we use the Cornerstone data to construct our views of the 'worst case', 'best case' and 'most likely' lengths of project delays (and, by extension, the proportion of projects/units not delivered by the end of the AMP). We use these three values as parameters to calculate our triangular distribution(s) of project delivery.

  It is likely that the risk of late and non-delivery will vary depending on the PCD in question. Therefore, we create five different distributions by varying the 'most likely' length of delay, based on the frequency of delays observed in the Cornerstone data. Effectively, this creates five different distributions, with the same 'worst case' and 'best case' outcome, but differing expected outcomes.

We then map these distributions of project delivery to specific PCDs. Affinity has provided us with its internal assessment of individual project risk (scored by the company on a scale of 1-5). We have interpreted a risk score of 3 to be approximately equal to the overall (average) risk; a score of 1-2 to indicate that the delay risk is lower than the average; and a risk score of 4-5 to indicate it is higher than the average. The distributions of project delivery for different risk scores are shown below, where the 'peak' of the distribution corresponds to the 'most likely' project overrun. These risk scores vary between Draft Determinations and Representations, since the adjusted allowances and delivery profiles proposed by Affinity are expected to lower its delay/delivery risk.

Figure 3: Delay distributions corresponding to risk scores 1-5
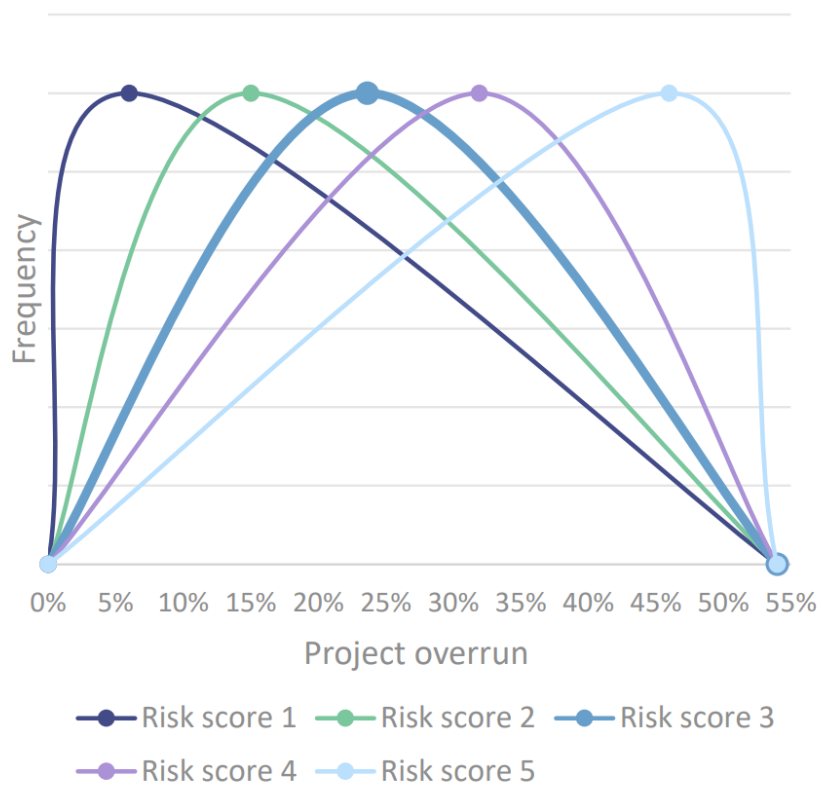
Source: Economic Insight analysis of Cornerstone data.

- **For Supply Interconnectors,** we assume that delivery on this PCD is Bernoulli distributed,[60] reflecting that only two outcomes are possible: either full delivery of the scheme occurs by the end of AMP8; or the scheme is incomplete. We use the risk score associated with Supply Interconnectors to assess the probability of delivery, based on the Cornerstone data. This corresponds to the 'most likely' probability of delivery for other PCDs of comparable risk.

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[60] *A Bernoulli distribution reflects situations where there are exactly two possible outcomes for an event (i.e. full delivery, or full non-delivery of the benefits associated with the Supply Interconnectors PCD). The Bernoulli distribution models the probability of each of the two outcomes occurring, with probabilities p and 1-p.*

Calculating the associated payments

d. **For each PCD, we convert the delivery distribution from a percentage, to the units of the PCD.** We do this by multiplying the delivery/delay risk distribution associated with a PCD by that PCD's target each year. This produces a distribution of performance, measured in the units of the PCD.

  – To estimate the risk under Ofwat's Draft Determinations, we do this for each of the 14 PCDs that apply to Affinity in Ofwat's Draft Determinations. To estimate the risk should Affinity's Representations be accepted, we do this for all the PCDs set out at Draft Determinations, along with "PFAS – Additional Business Case", which Affinity has proposed as an additional PCD. In doing so, we use the PCD targets from Draft Determinations, and Affinity's Representations, respectively.

e. **We calculate the relevant non-delivery and time incentive payments,** for each PCD and for each value in its performance distribution (for each year of PR24).

  – Non-delivery payments are estimated for the price control period as a whole, calculated as the number of units not delivered, multiplied by the unit cost of non-delivery, adjusted for the sharing rate. We use a sharing rate of 40:40 for enhancement expenditure and 50:50 for base expenditure, in line with Ofwat's Draft Determinations.[61]

  – Time incentive payments are calculated separately for each year of the price control. Outperformance payments are calculated as the number of units delivered on time multiplied by the outperformance rate; and underperformance payment rates are calculated as the number of units not delivered in a given year, multiplied by the underperformance rate.

  – To estimate Affinity's risk under the Draft Determinations, allowances and penalty rates are taken from Ofwat's Draft Determinations. To estimate the risk under Affinity's Representations, these are taken from Affinity's Representations.

  – PCD payments are discounted using the WACC, in line with Ofwat's PCD worked example of PCD calculations.[62]

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[61] *We note that Ofwat does not plan to adjust PCD rates for cost sharing, following its Draft Determinations. Instead, it will adjust totex allowances to reflect non-delivery, then apply cost sharing to these adjusted allowances. However, we retain the cost sharing adjustment here as this serves as a suitable approximation of the risk from non-delivery, in the scenario that companies spend their allowances but delivery does not materialise – in which case a proportion of the spend on a project is shared with customers, in line with the cost sharing rate.*

[62] *Please see: 'Price control deliverable payments model', Ofwat (July 2023).*

–   For the PCD 'Supply Interconnectors', when full delivery materialises, Affinity receives a time incentive outperformance reward payment. When the scheme is incomplete, Affinity incurs a full non-delivery penalty equal to the total scheme allowance, and 1-years-worth of time incentive penalties. These are the only two outcomes possible. Therefore, it is unnecessary to model payments using econometric modelling, which is Ofwat's approach to calculating payments for "scheme level" PCDs.

f.   **We convert the distributions of PCD payments to a percentage RoRE** using Affinity's RCV, and notional gearing figures. To model risk under Ofwat's Draft Determinations, we use RCV figures from the Draft Determinations. To model the risk should Affinity's Representations be accepted, we use Affinity's proposed Representations RCV. For both views, we use notional gearing of 55%, in line with our methodologies for other risk areas. A breakdown of the individual risk ranges per PCD (prior to Monte Carlo aggregation) can be found in Section 7D.

g.   **We then run all the individual PCD RoRE risk distributions through a Monte Carlo model** to estimate the overall risk range for this area. This reflects the fact that it is unlikely Affinity will perform at the extreme ends of the distribution for all PCDs simultaneously. Further details of our rationale for, and approach to using Monte Carlo models is set out in Chapter 8.

7C.   Changes to our approach since Business Plan submission

As shown in Table 10, our assessment of PCD RoRE risk has changed significantly compared to the risk range estimated at Business Plans. This is primarily driven by updated information on PCDs that Ofwat has published since its Final Methodology. Below, we outline each of the changes we have made in turn.

*   **The scale and scope of PCDs for Affinity has changed.** In its Draft Determinations, Ofwat outlined 14 PCDs that will apply to Affinity at PR24, 9 of which are to have non-delivery incentives only (i.e. no time incentive payments are available). This list differs substantively from the PCDs proposed by Affinity in its Business Plan. In addition, Ofwat has set out the PCD payment rates and target delivery profiles that will apply. Again, these substantively differ from those in Affinity's Business Plan.

*   **Ofwat has changed its method for calculating time incentive payments.** At Business Plan submissions, we modelled time incentive payments as a penalty-only mechanism that applied to all PCDs at 3.5% of relevant totex. However, at Draft Determinations, Ofwat ruled that the (underperformance) time incentive rate will instead equal the WACC and that companies will have the possibility of earning outperformance payments for timely delivery, with the outperformance rate set at ¼ of the underperformance rate.

- **Our approach to calculating risk for binary projects has changed.** We now consider projects with no possibility of partial delivery to follow a Bernoulli rather than triangular distribution, such that the only two outcomes modelled are full delivery and full non-delivery.

- **Risk scores have been updated.** As Ofwat has made changes to the PCD framework, Affinity has updated its expert view of the degree of risk associated with each relevant investment scheme.

- **Triangular distributions**: As for all other risk areas, since Business Plan submissions we have updated our approach to construct triangular distributions from historical data for use in our Monte Carlo model. This change is explained in more detail in Chapter 8.

7D. Individual PCD risk results

Table 11 illustrates the contribution to the overall risk range from each PCD, under both Ofwat's Draft Determinations and Affinity's Representations. [63]

Table 11: Individual PCD risk ranges, ordered by P10 pre-mitigations.

	DD risk		Risk under Affinity's Representations	
	P10	P90	P10	P90
Supply Interconnectors	-0.82%	+0.01%	-1.16%	+0.01%
Mains renewals	-0.22%	-0.06%	-0.18%	-0.03%
Metering - Meter Replacements	-0.12%	-0.03%	-0.16%	-0.04%
Metering - New installations	-0.07%	-0.02%	-0.08%	-0.02%
Demand-side improvements	-0.07%	-0.02%	-0.06%	-0.02%
Metering - Meter upgrades	-0.07%	-0.02%	-0.08%	-0.02%
Water WINEP WFD - WINEP WFD actions	-0.06%	-0.02%	-0.08%	-0.02%
Water WINEP WFD - Heronsgate to Bovingdon pipeline	-0.06%	-0.02%	-0.07%	-0.02%

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[63] *Note that we have excluded any PCDs from the table below where all deliverables are specified for after AMP8 (such that there is no non-delivery / delay risk associated with AMP8).*

Water WINEP WFD - Harefield to Harrow interconnector	-0.05%	-0.01%	-0.06%	-0.02%
Water WINEP WFD - Local Replacement schemes WRZ3	-0.04%	-0.01%	-0.05%	-0.01%
Water Quality (RWD and TOC) - Nitrate	-0.03%	-0.01%	-0.04%	-0.01%
Water Quality (RWD and TOC) - PFAS (Accelerated)	-0.01%	-0.00%	-0.02%	-0.00%
Security - SEMD - AMP8 Emergency Planning	-0.00%	-0.00%	-0.00%	-0.00%
Security - SEMD - AMP8 Physical security	-0.00%	-0.00%	-0.00%	-0.00%
Monte Carlo aggregation	**-1.39%**	**-0.43%**	**-1.73%**	**-0.46%**
Simple aggregation	**-1.62%**	**-0.20%**	**-2.04%**	**-0.21%**

Source: Economic Insight analysis

8 Aggregating the risks: our use of Monte Carlo models

In this chapter, we set out: (i) why we use Monte Carlo simulation models to aggregate across risk ranges; (ii) the details of how we implemented the Monte Carlo models; and (iii) the choices we have made in generating the probability distributions that input into the Monte Carlo models.

8A. Our use of Monte Carlo simulations

Monte Carlo simulations are used at several points in our analysis, both to aggregate risks within specific risk areas (such as aggregating the risk ranges for multiple PCs, to produce a single outcomes risk range), and to aggregate the risks across all risk areas, to produce our overall risk range.

There are two key reasons for using Monte Carlo simulations to aggregate the results:

- Firstly, this method reflects the fact that it is highly unlikely that Affinity will experience the extreme ends of all risks simultaneously – i.e. it is unlikely to perform at the P10 on each risk area at the same time. A Monte Carlo model therefore builds in a more realistic range of possibilities.

- Secondly, the output of the Monte Carlo simulation is not simply a range of two numbers, but a distribution of possible values of an aggregated outcome. This allows us to gather more information about expected RoRE (e.g. most likely value, P10, P90), than we could gain from a simple aggregation approach.

8B. Details of our methodology

To aggregate risk ranges using a Monte Carlo, we undertake the following steps:

a. **Generate a performance distribution for each risk area**. We estimate the minimum, most likely, and maximum performance level at PR24 for each risk area, and use these as parameters from which to construct a triangular distribution of performance for each area. Details of the choices we have made to establish the minimum, most likely, and maximum performance levels used to generate these distributions are set out in section 8C.

b. **Set the 'seed'**. The Monte Carlo model relies on selecting random numbers. When using random numbers for analysis, it is best practice to set a 'seed'. A seed allows you to select the same set of random numbers upon re-running the Monte Carlo simulation, thereby ensuring that the outputs of the simulation will be replicable.

c. **Set a number of simulations**. The Monte Carlo model relies on using many simulations of outcomes that could result based on the underlying distributions. The more simulations that the Monte Carlo uses, the more accurate its final output will be; and thus the less sensitive to the choice of seed. We use 10,000 simulations for our Monte Carlo models.

d. **Run the model**. The Monte Carlo model selects a random number from each of the underlying performance distributions and sums them, repeating this 10,000 times. This produces a distribution of aggregated results, with 10,000 observations.

e. **Calculate percentiles**. The output of the Monte Carlo model is a distribution of potential outcomes. Taking the 10th and 90th percentile of this distribution produces the desired P10 to P90 risk range.

8C. Our choice of performance distributions

We generally use a triangular distribution to describe performance on specific risk areas, as is common for Monte Carlo simulations where data is sparse.[64] To construct a triangular distribution, we require the following three parameters: (i) the mode, or the most likely level of performance; (ii) the lower limit of performance; and (iii) the upper limit of performance.

The following subsections explain how we arrived at each of these three parameters, and used them to generate triangular distributions for use in our Monte Carlo simulations.

Assessing the 'most likely' value

Given the sparsity of the historical performance data we have relied upon for our risk analysis, it has not been feasible to accurately calculate the 'most likely' performance level for each risk area how one typically would – by calculating the 'mode', or the most frequently achieved level of performance.

Therefore, we typically take the *mean* value from our historical performance data and use this to represent the 'most likely' performance level, as a proxy for the mode. The implication of this is that we are assuming that all risk ranges are centred around the mean level of performance, or in other words, that the 'most likely' performance level is the average level of performance observed in the past. Exceptions to this include:

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[64] *Using triangular distributions for Business and Finance Simulations in Excel*, Fairchild, Misra, and Shi (2016) vol 42, no.3-4. Note that we use a uniform distribution rather than triangular distribution for BR-MeX, as explained in section 6C

- **Where we use expert judgement within our ODI risk analysis**. In this instance, Affinity has provided its own view of the 'most likely' performance level it will achieve over PR24.

- **Our cost of new debt analysis.** Here, we use the midpoint between our P10 and P90 estimates, due to a lack of data availability regarding 'most likely' performance.

Establishing the upper and lower bounds of our triangular distributions

As set out above, alongside the 'most likely' value, we also require estimates of an upper and lower performance limit in order to generate the triangular distributions that feed into our Monte Carlo simulations. We have two key methodological choices to make regarding precisely how these performance limits are calculated, and implemented, explained below.

The scope of triangular distributions

The first choice we have is around the scope of the triangular distributions calculated. Specifically, this is whether we use triangular distributions for each risk area that either:

- **Method (a):** represent the full range of possible performance levels for that risk area (i.e. that includes even the most extreme possible outcomes); or

- **Method (b):** represent the 'reasonable' range of possible performance levels that could arise for that risk area (i.e. captures the performance that lies exclusively between the P10 and P90 levels).

This decision impacts the way in which the Monte Carlo is used, and more specifically, how the output distribution of the Monte Carlo should be interpreted. Specifically:

- If method (a) is used, the Monte Carlo model selects random numbers from the *full* underlying performance distributions for each risk area, from minimum to maximum, meaning that the distribution produced by the Monte Carlo captures the extreme ends of possible performance. As a result, the P10 and P90 performance levels should be taken from this resultant distribution as the overall RoRE risk range.

- However, if method (b) is used, the Monte Carlo model selects random numbers *between* the P10 and P90 levels of performance for each underlying distribution. This means that the distribution produced by the Monte Carlo only captures between the P10 and P90 performance levels. Therefore, the minimum and maximum performance levels should be taken from this resultant distribution as the overall RoRE P10 to P90 risk range.

To construct Affinity's Business Plan risk range, method (a) was used. Under this method, increasing the number of simulations run by the Monte Carlo results in the output P50 in our model converging towards the underlying 50th percentile outcome. However, the minimum and maximum values obtained (which we take as the P10 and P90 for the overall risk range) converge towards the P10 and P90 that is produced by simply aggregating the P10 and P90 of each input distribution. This is because, the more simulations are run, the more likely it will be that one of the simulations will simply be the addition of the most extreme ends of the performance range for each area.

Therefore, while the results produced using method (b) are defendable and 'correct', we consider that this method loses some of the benefits of implementing a Monte Carlo model. To estimate Affinity's risk at DDs, and at Representations, we therefore use method (a).

<u>The use of inferred or observed performance bounds</u>

When using the above method (a) – constructing triangular distributions that cover the full range of performance – we have a second methodological choice over precisely how we identify the performance limits of our triangular distributions. There are two ways of identifying the upper and lower performance limits here:

(i) We can take the *minimum* and *maximum* performance values, as given by the historical performance data. By using these values alongside the 'most likely' value, we obtain a triangular distribution as illustrated by the blue lines in the diagram below. From this distribution, we are then able to *infer* the P10 and P90 levels of performance, as illustrated by the grey dotted lines. These P10 and P90 levels are used to define our risk range for the risk area in question.

Figure 4: Method (i) for constructing a triangular performance distribution from historical data
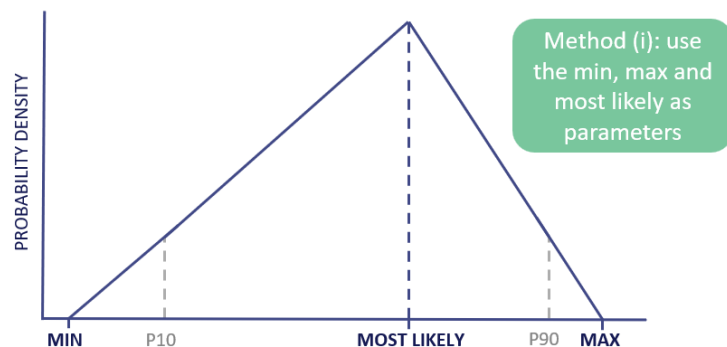
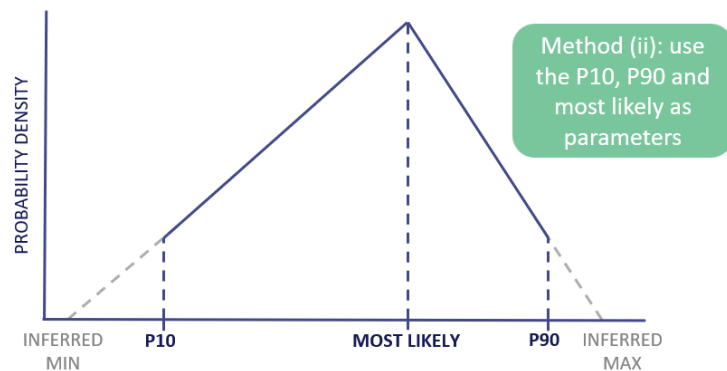*Source: Economic Insight*

This method is appropriate if we believe that the extreme values *observed* in the underlying data reflect a performance level that Affinity could feasibly achieve over PR24. For instance, if Affinity has been shown to achieve similar levels of performance in the past, we would want to ensure this level of performance is used to construct the probability distribution.

(ii)   We can take the *10th percentile (P10)* and *90th percentile (P90)* values, as given by the historical performance data. By using these values alongside the 'most likely' value, we obtain a triangular distribution as illustrated by the blue lines in the diagram below. These P10 and P90 values are used to define our risk range for the risk area in question. We then use these data points to *infer* the minimum and maximum levels of performance, as shown by the dotted grey lines, to generate the full triangular distribution we require to feed into our Monte Carlo models.

Figure 5: Method (ii) for constructing a triangular performance distribution from historical data

Source: Economic Insight

This method is more appropriate if we believe that the extreme values observed in the underlying data used **do not** reflect a performance level that Affinity could feasibly achieve over PR24. For instance, if we consider that the most extreme performance values within the dataset in question relate to anomalies, we consider it appropriate to instead rely on the P10 and P90 historical performance levels to construct the probability distribution.

The implication of using these different methods is that they can result in slightly different-looking performance distributions, even when based on the same underlying data. This is because method (i) uses the *most extreme results* as parameters for the probability distribution, whereas method (ii) does not – it infers the expected minimum and maximum performance values from the 10th and 90th percentiles of the data. Therefore, when the minimum and maximum values in the observed data are particularly extreme, method (ii) has the effect of limiting the tails of the triangular distribution. Conversely, when all of the performance data is bunched quite closely together, using method (ii) can have the effect of lengthening the tails of the distribution.

Given this, we consider that the underlying data dictates which method it is most appropriate to employ, and for each risk area we choose the method that produces the performance distribution we think *best reflects Affinity's likely performance at PR24.* For example, we use method (i) when constructing a performance distribution for revenue incentive mechanisms. This is for two key reasons.

- First, because we use Affinity-only data for this risk area. This means that the extreme (minimum and maximum) levels of performance observed represent a level of performance that Affinity has in fact achieved in the past. Since this performance was feasible previously, we have no evidence to suggest that such a performance level would no longer be achievable for Affinity at PR24.

- Additionally, using Affinity-only data limits the number of data points we have available from which to construct a distribution. Therefore, it is difficult to conclude whether the minimum and maximum performance levels are anomalous results.

However, for other risk areas, such as retail costs, we use method (ii). This is because:

- For this risk area, we use industry-wide historical performance data. As a result, the extreme (minimum and maximum) levels of performance might not represent feasible retail cost performance levels *for Affinity specifically*. Company-specific factors might influence performance on retail costs, and therefore, the most extreme levels of performance achieved by other companies may not be considered feasible for Affinity.

- In addition, the use of industry-wide performance data means that our dataset consists of many more observations than it would were we to use Affinity-only data. Due to this increase in data, we are better able to understand whether the 'extreme' values in the distribution represent anomalous results. For retail costs, the minimum level of performance observed across the industry is a 60.7% overspend against allowances. In contrast, the P10 level of performance is a 35.1% overspend against allowances. Given the large difference between the minimum and P10 performance levels, we can assume that the minimum level of performance represents an anomalous result, and therefore, we would want to use the P10 level to construct our triangular distribution.

Table 12 overleaf illustrates which method we have employed to construct the performance distributions for each individual risk area. These methods are consistent between both the 'DD risk' range and the 'risk under Affinity's Representations' range.

Table 12: Details of the data and method used for individual risk areas to calculate Affinity's risk under Ofwat's Draft Determinations and should the Representations be accepted in full

Risk area	Data used to establish expected performance levels	Method used to generate the triangular distribution	Reasoning	Risk area specific Monte Carlo used?
Totex	Industry-wide historical performance data.	We take the mean, 10th percentile, and 90th percentile levels of historical performance.	We use industry-wide historical performance data, which provides sufficient observations for us to establish that the 'tails' of the distribution are very long – indicating that the 'extreme' (minimum and maximum) values may be anomalies.	No.
Retail costs	Industry-wide historical performance data.	We take the mean, 10th percentile, and 90th percentile levels of historical performance.	We use industry-wide historical performance data, which provides sufficient observations for us to establish that the 'tails' of the distribution are very long – indicating that the 'extreme' (minimum and maximum) values may be anomalies.	No.
Revenue incentive mechanisms	Affinity-only historical performance data.	We take the mean, minimum, and maximum levels of historical performance.	We use Affinity-only historical performance data, which means that we have relatively few observations compared with if industry-wide data was used. In addition, each of the observations used represents historical levels of performance that Affinity has previously achieved.	No.

Financing	Inflation risk	Annual ONS inflation data over the past 10 years.	We take the 10th percentile, and 90th percentile, and the mean for the 'most likely' scenario. This is done for both CPIH inflation and the wedge between RPI and CPIH inflation.	To avoid relying on 'extreme' results, we use the P10 and P90 levels of inflation observed over the past 10 years.	No.
	Risk of raising new debt	Ofwat view of the cost of new debt risk range.	We take the 10th percentile, 90th percentile, and the midpoint between the P10 and P90 as the 'most likely' scenario.	We adjust the risk range identified by Ofwat to reflect what we consider to be a more realistic range of performance. Given this, we use the parameters provided by Ofwat to calculate the triangular distribution (i.e. the P10 and P90).	
ODIs		Primarily Affinity-only historical performance data, supplemented with expert judgement.	Where we use historical performance data, we take the mean, minimum, and maximum levels of historical performance Where we use expert judgement, we take the 'most likely', P10 and P90 values provided to us by Affinity to construct the triangular distribution, inferring the 'tails' of the distribution.	We use Affinity-only historical performance data for each PC, which means that we have relatively few observations compared with if industry-wide data was used. In addition, each of the observations used represents historical levels of performance that Affinity has previously achieved. Experts have provided the P10, 'most likely', and P90 values only, for each PC. Therefore, we use these to infer the min and max of the triangular distribution, for expert judgement.	Yes –aggregate risk ranges for each of the individual PCs and MeX.
Measures of experience		Industry-wide levels of historical performance to inform the upper and lower bounds, Affinity-only data to inform the 'most likely' performance level.	We take the mean, minimum, and maximum levels of historical performance.	Our method for MeX uses relative performance between companies rather than absolute performance to calculate a risk range. Since we believe it is feasible for Affinity to be both the best and	

			worst performing firm in a single year of PR24, we use the MeX scores corresponding to the worst industry position (17th) and best industry position (1st) as parameters to construct our performance distribution.	
Price Control Deliverables	Cornerstone survey data on delay durations in large-scale construction projects in the UK in 2022.	We take the mean, minimum and mode duration of construction delay.	The survey data is reported in duration bands (of 10%) rather than specific durations per observation. In our analysis, we have assumed all observations recorded in each range as the midpoint of that range. The outlier risk is therefore mitigated by using the midpoint of the maximum and minimum ranges as well as the fact that these ranges have a reasonable number of observations expected in a normal distribution.	Yes – to aggregate across all PCDs.

A Annex: ADD18 commentary

- As shown in the table overleaf, the numbers in this report deviate from those reported in the ADD18 submission. The reasons for these differences are as follows:

- **The RCV used to convert the risk into a % of RoRE differs for Affinity's Representations.** The risk range should Affinity's Representations be accepted in full is stated on a different basis in this report and in table ADD18. For table ADD18, the risk range is calculated based on the RCV as per the Draft Determinations, in line with Ofwat's guidance. However, we consider that to arrive at a robust risk range, one must use the RCV that is consistent with the scenario in question. As a result, the figures in this report are calculated on the basis of the RCV proposed in Affinity's Representations. In response to the query raised by Affinity on this guidance, Ofwat responded that "*[w]e agree that company representations may lead to changes in the RCV and hence regulatory equity. However, we do not consider that this is a material factor in the consideration of the balance of risk*".

- **Averaging over AMP8.** The way in which risk ranges are averaged over the years of AMP8 differs between this report and ADD18. To arrive at the figures presented in this report, we calculate the AMP8 average for each risk area as the average impact in pounds sterling divided by the average regulated equity, *before* aggregating these AMP8 averages across risk areas. Table ADD18 aggregates the risk ranges in % RoRE across risk areas for each year first, and *then* takes a simple average of these annual percentages.

- **Aggregating totex, PCDs, and outcomes risk.** As measures of experience are part of the same aggregate sharing mechanism as ODIs, we *only* report a combined risk range for these areas. This combined range is reflected in the ODI line of table ADD18, and thus the lines for measures of experience are populated with zeroes. Further, this report does *not* aggregate totex risk and with the non-delivery portion of PCD risk, while the ADD18 table reports these areas together in % RoRE terms. This is because we consider it important to view the risk added to the regulatory framework as a result of PCDs in full, rather than some of this risk being separated out and included under totex.

- **Aggregating financing risk under the Draft Determinations.** In the ADD18 table, the P10s and P90s of inflation risk and new debt issuance risk are reported separately before being added to produce an overall financing risk range. The figures in this report may differ slightly as they are stated based on constructing a probability distribution for overall financing risk first, and then taking the P10 and P90 of this distribution.

Table 13: RoRE risk ranges in this report compared to ADD18

Risk area	Risk under the Draft Determinations (this report)		Risk under the Draft Determinations (ADD18)		Risk under Affinity's Representations (this report)		Risk under Affinity's Representations (ADD18)	
	P10	P90	P10	P90	P10	P90	P10	P90
Totex	-2.43%	1.19%	-3.84%	0.80%	-2.07%	1.15%	-4.23%	0.82%
PCDs	-1.39%	-0.43%			-1.73%	-0.46%		
Retail costs	-1.29%	0.38%	-1.29%	0.38%	-1.17%	0.35%	-1.29%	0.38%
Revenue forecasting incentive	-0.01%	0.00%	-0.01%	0.00%	-0.01%	0.00%	-0.01%	0.00%
Financing costs	-1.85%	1.51%	-1.86%	1.52%	-1.79%	1.78%	-1.99%	1.99%
ODIs	-3.26%	-1.50%	-3.26%	-1.50%	-1.19%	-0.20%	-1.33%	-0.21%
MeX			0.00%	0.00%			0.00%	0.00%
Total (simple aggregation)	**-10.24%**	**1.14%**	**-10.27%**	**1.19%**	**-7.96%**	**2.62%**	**-8.85%**	**2.98%**

Source: Economic Insight analysis; ‘PR24 Additional Business Plan Tables for submission following draft determinations’, Ofwat (2024).

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