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UPDATED COST OF EQUITY CROSS-CHECK EVIDENCE

A report prepared for the Energy Networks Association

22 NOVEMBER 2024

Contents

Summary

Following the publication of the Sector Specific Methodology Decision (SSMD) in July 2024 the Energy Networks Association (ENA) has asked us to provide an update on cross-check evidence for RIIO-3.[1]

The updates set out in this document build on the cross-check evidence we set out in our March 2024 Investability report ("our Investability Report")[2], submitted to Ofgem by the ENA as part of its response to the Sector Specific Methodology Consultation (SSMC). This report provides updates for:

- a range of cross-checks that test the adequacy of the Step 1 Cost of Equity (CoE), including:
  - The hybrid bond cross-check;
  - Infrastructure fund implied equity Internal Rate of Return (IRR);
  - Market to Asset Ratios (MARs);
  - Long-term profitability benchmarking; and
- a range of further cross-checks that test whether Ofgem's point estimate and range for Total Market Return (TMR) are appropriate.

We set out our key findings below.

Key findings

Cost of equity cross-checks

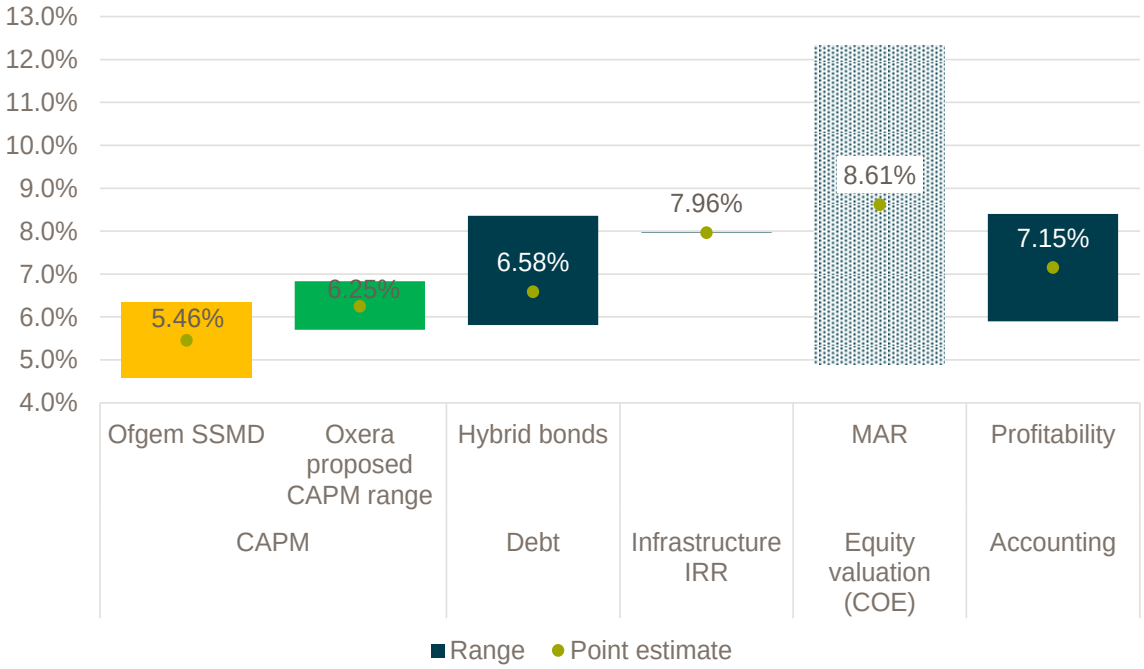
The overall finding of these updated cross-checks is that the CoE range proposed in Ofgem's SSMD Step 1 CAPM estimation is too low. Furthermore, the midpoint of Ofgem's range will not satisfy its equity investability objective.

Our hybrid bond cross-check, following further robustness testing, continues to indicate that Ofgem's proposed RIIO-3 CAPM CoE range is too low. The mid-point of Ofgem's range of 5.46% in CPIH-real terms lies below the lower bound of the hybrid bond cross-check range of 5.80%, and the top of Ofgem's range falls below the point estimate of the hybrid bond cross-check range. This is shown in the figure below.

1 The July 2024 SSMD applies to Transmission and Gas Distribution networks.

2 Frontier Economics (2024) Equity Investability in RIIO-3, a report prepared for the ENA.

Figure 1 CoE estimates and cross-checks (CPIH-real)



Source: *Ofgem, Frontier Economics, Oxera*

Note: *All figures in CPIH real. To derive CPIH-real figures, we consider a CPIH assumption of 2% and deflate nominal estimates using the Fisher equation*

This finding is further supported by the other CoE cross-checks, even though individually we consider these to be less reliable in providing definitive conclusions on whether the precise proposed level of CoE is sufficient to secure investability.

- Updated results drawn from infrastructure fund IRRs show a point estimate of 7.96%, which is also well above Ofgem's point estimate.
  - We consider this cross-check most informative for informing on the potential scale of change in allowed returns over time, rather than the required level of CoE allowance.
  - There has been a four percentage point increase in this cross-check since Ofgem reviewed the evidence at RIIO-T2/GD2. This indicates that a more significant increase in the allowed CoE is likely to be required for RIIO-3 than Ofgem has so far been minded to provide.
- In respect of MARs, we find that a range of plausible assumptions supports a broad implied CoE range of 4.90% - 12.33%. This reflects the inherent uncertainty associated with unpicking the causes of MARs. We observe that although Ofgem's point estimate appears to be within this range, it is at the bottom end of a very wide range.

Our findings are entirely consistent with those reported in our Investability Report for the ENA. We also find that Oxera's proposed CAPM range is more consistent with the cross-check evidence. In particular, Oxera's range is more in line with the range implied by the hybrid bond cross-check evidence.

We find that a key contributor to the SSMD CoE range being too low is likely the TMR range proposed by Ofgem. This range does not pass the TMR cross-checks, as we show in the following section.

Total market return cross-checks

Ofgem has hitherto relied on survey evidence as its only TMR cross-check, but this evidence does not necessarily inform on whether the TMR is consistent with an investable allowed CoE. We have developed a set of further TMR cross-checks based on market evidence which addresses this question. Indeed, we find that these new cross-checks corroborate the latest survey evidence.

Summary of TMR cross-checks

The figure below summarises available TMR cross-check evidence against Ofgem's proposed SSMD TMR range (in CPIH-real terms). These include the:

- ***TMR Glider***. The TMR Glider was developed at SSMC stage to provide a framework for a TMR which is 'stable but not fixed' in line with UKRN Guidance.[3] The Glider draws on the linear relationship between the market TMR and gilt yields.[4]
- ***Dividend Growth Model (DGM)***. The DGM is a common model for evaluating the market TMR. In the DGM model, the market TMR is the discount rate which is given by prevailing stock prices and expectations for dividend growth.
- ***124-year long term historic average***. This is the 124-year historical UK stock market return reported by Dimson, Marsh and Staunton, and is a key data point for TMR assessments in a regulatory context.[5]
- ***Survey evidence***. Ofgem considers the TMR estimates published by investment managers as a cross-check. We propose to supplement data from investment managers with academic survey evidence (the Fernandez survey).[6]

3 Frontier Economics (2024) The relationship between total market return and gilt yields. For ease of reference, we may refer to this report as 'Our TMR Glider' report in the remainder of this report.

4 Where the market TMR is derived using a Dividend Growth Model.

5 Indeed, this data point is considered by Ofgem in formulating their range (amongst other points of reference).

6 Which has a long history and covers a broad range of respondents, from practitioners to academics.

Figure 2 TMR estimates and cross-checks (CPIH-real)

Source: *Ofgem, Frontier analysis, Oxera*

Note: *All figures in CPIH real. To derive CPIH-real figures for the cross-checks, we consider a CPIH assumption of 2% and deflate nominal estimates using the Fisher equation.*
TMR Glider range represents the observed range over the last 12 months, which is 7.77% - 7.95%, with an average of 7.83%. All figures presented to 2 d.p.
The DGM range represents the observed range over the last 12 months which is 7.07% - 8.69%, with an average over the last 12 months of of 7.79%. All figures presented to 2 d.p.

The TMR cross-checks show that the TMR assumption included in Ofgem's Step 1 CoE is too low when viewed against the cross-check evidence. We conclude that the range and point estimate for TMR proposed by Ofgem is insufficient, and that this plays an important role in explaining why Ofgem's overall CoE is found to be too low when compared against the values derived from our CoE cross-checks.

A TMR range consistent with Ofgem's objectives and the UKRN's guidance

We understand that Ofgem's policy objectives with respect to RIIO-3 include safeguarding investability, but at the same time Ofgem has expressed its intent to also look through the cycle, although Ofgem acknowledges that both of these objectives may not always be in agreement. It has stated that a balanced set of cross-checks can support navigating these tensions.[7]

We also note that the UKRN cost of capital guidance supports a stable TMR. This means that TMR (and thus the CoE) can reflect movements in interest rates, but not on a one-to-

[7] See Ofgem (2024) RIIO-3 Sector Specific Methodology Decision – Finance Annex, para. 3.265.

one basis.[8] It is also worth noting that the UKRN's guidance may not be in full agreement with Ofgem's 'through the cycle' approach.

We consider our proposed TMR cross-checks can inform a TMR range which is stable (consistent with the UKRN Guidance), investable, and acknowledges Ofgem's policy objective of looking through the cycle.

In Figure 3 below we set out evidence over time from the TMR Glider, DGM and the 124-year historic ex post average.[9] We find that the trend in these TMR cross-checks over time support a long-run unconditional[10] stable range of 6.5% - 7.5% around the 124-year average of 7.0%. Such a range can be consistent with the policy objectives set out by Ofgem and the UKRN.

- The central point of this range is defined by the long-run, 124-year historical average, which is approximately 7.0% CPIH-real.[11]
- The TMR Glider provides a framework for a TMR which moves with gilt yields, although much less than one-to-one. We noted the width of the Glider interquartile range is c. 1%, and therefore this could be interpreted a reasonable range of variation of a stable TMR.[12]

8 See UKRN (2023) Cost of UKRN guidance for regulators on the methodology for setting the cost of capital, p16 and 17.

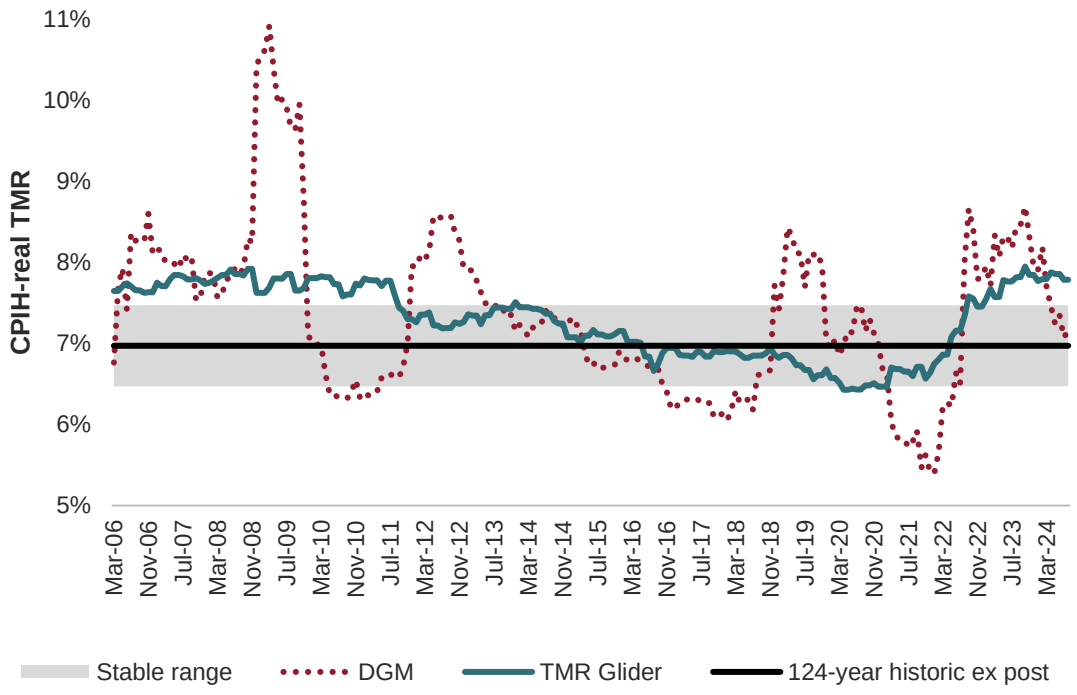
9 The timeframe reflects the total data period over which our DGM outputs were available.

10 In this case we mean that a TMR which is unconditional on prevailing capital market conditions.

11 To be precise, this figure is 6.97% CPIH-real but we round this to 7% for ease of discussion.

12 We note that the TMR Glider predictions appear to be fairly symmetrical in that both the median and average both lie around 7.3% CPIH-real.

Figure 3 DGM-based TMR cross-check evidence and the long-run historical



Source: Frontier analysis, Ofgem
Note: CPIH-real figures have been derived using an inflation assumption of 2%, deflated using the Fisher equation.

Taking all of the evidence together, we consider it reasonable to conclude that a **long-run unconditional, stable range of 6.5% - 7.5% CPIH-real**, anchored around the long-term average of 7.0% CPIH-real, could be an approach to setting the TMR which meets the stated policy objectives. We consider that this range reflects a 'through the cycle view', and provides sufficient flexibility to allow Ofgem to respond to changes in the macroeconomic environment in a stable and predictable way.

There remains a question of whether a narrower range is suitable for RIIO-3. In Figure 3, we observe that the DGM and TMR Glider values have been consistently above the stable range in the last 24 months. This indicates that the market required rate of return has been relatively high. On this basis - and on the basis of the hybrid bond cross-check - there are strong reasons to set the TMR range at the top half of the stable range for **RIIO-3, at 7.0% - 7.5%**. We note that this is consistent with Oxera's recommendation in its CAPM report. Further, we recommend that the point estimate should be towards the top of that range.[13]

[13] Oxera (2024) 'RIIO-3 cost of equity—CAPM parameters', Prepared for Energy Networks Association

Conclusion and next steps

The available cross-check evidence shows that the CoE range proposed in Ofgem's SSMD is too low and that the point estimate is inconsistent with a number of important cross-checks. If left unchanged, this level of allowed equity return would not achieve Ofgem's stated objective of ensuring that the RIIO-3 price control package is investable.

We find that a key contributor to the SSMD CoE range being too low is likely the TMR range proposed by Ofgem. The SSMD TMR range is inconsistent with the TMR cross-checks presented in this report, and the proposed uplift of just 25 bps from RIIO-2 is at odds with the scale of change seen in wider market evidence since that decision.

In contrast, a TMR range of 7.0% - 7.5% CPIH-real proposed by Oxera is in line with the TMR cross-check evidence, which supports a point estimate for RIIO-3 to be towards the top of that range. Along with other changes proposed by Oxera, it also leads to an overall CoE range that mitigates investability risks. It is our view that Oxera's recommendations provide a good indication of the changes that Ofgem should make to its position on CoE over the coming year.

1 Introduction

1.1.1 Frontier Economics has been commissioned by the ENA to undertake further work on the topic of cross-check evidence for RIIO-3. This follows the publication of the of the Sector Specific Methodology Decision (SSMD) in July 2024.

1.1.2 The updates set out in this document build on the cross-check evidence we set out in our March 2024 Investability report, submitted to Ofgem by the ENA as part of its response to the Sector Specific Methodology Consultation (SSMC).

1.1.3 **The report is divided into two parts**:

1.1.4 **Part 1 sets out cross-checks that test the adequacy of the allowed Cost of Equity (CoE).** Specifically, these cross-checks test Ofgem's SSMD 'Step 1' CAPM range. A key objective of this part of the report is to examine whether Ofgem's range will satisfy equity investability. This part is structured into five sections:

- Section 2 sets out evidence on the hybrid bond cross-check;
- Section 3 sets out evidence on the Infrastructure fund implied equity Internal Rate of Return (IRR) cross-check;
- Section 4 sets out evidence from Market to Asset Ratios (MARs);
- Section 5 sets out evidence from long-term profitability benchmarking; and
- Section 6 concludes with a review of all CoE cross-check evidence.

1.1.5 **Part 2 sets out cross-checks that test the adequacy of the Total Market Return (TMR)**. These cross-checks test the range for the TMR that is used as an input to the Ofgem SSMD 'Step 1' CAPM range. This part is structured into three sections:

- Section 7 sets out evidence derived from dividend growth model (DGM) estimates of TMR;
- Section 8 sets out evidence from surveys; and
- Section 9 concludes with a review of all TMR cross-check evidence.

PART 1: COST OF EQUITY CROSS-CHECKS

2 Hybrid bond cross-check

2.1 Our Investability Report

2.1.1 In our Investability Report for the ENA we introduced the hybrid bond cross-check.[14] This cross-check was targeted at addressing Ofgem's proposal to set an investable allowed return. Specifically, this cross-check evaluates whether the allowed equity return lies sufficiently far above the long-term return on debt.

2.1.2 Because of the difference in risk between debt and equity, we set out that it would be irrational for investors to opt for equity if returns were similar to or below senior debt.

2.1.3 We drew on hybrid bonds to address the question: how much higher should equity returns be relative to debt? Hybrid bonds are a security that combines equity and debt features. Since the yield on these hybrid bonds is directly observable, with an appropriate assumption on the proportion of equity-like feature of the hybrid bond, an expected return on equity can be implied from a relatively simple formula.

2.1.4 The data we used for the cross-check was focused on hybrid bonds issued by GB Utilities, and in particular those issued by National Grid.[15] The main input to the cross-check was data from the NGG Finance Plc 2073 hybrid bond.[16]

2.1.5 This focus was intentional, as the 2073 hybrid bond had the most suitable properties:

- NG can be considered a 'pure play' network company – with the vast majority of revenues and assets being associated with regulated networks. A large share of NG's activities also reflect risk specific to GB network regulation i.e. RIIO.
- This NG bond had a long tenor to the first call date (over 12 years).

2.1.6 Using this data we estimated a cross-check output of 6.7% CPIH-real. This is set out in Figure 4 below. We also undertook a range of sensitivity analysis, which formed a range of 5.8% to 8.5% CPIH-real.

14 Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA'.

15 NGG Finance Plc.

16 This bond was issued in March 2013 and had a first call date of June 2025.

Figure 4 Hybrid bond cross-check calculation included in our March Investability Report

#	Component	Estimate
1	Spread at issue	151bps
2	Default risk adjustment	-15bps
3 = 1-2	Spread (adjusted for default risk, at issue)	136bps
4	Equity-likeness %	50%
5 = 3/4	Higher returns on equity (based on 50% equity-like)	272bps
6	iBoxx £ Utilities 10Y+ (2023 average)	5.89%
7 = 5+6	Nominal equity returns	8.7%
8	**Real equity returns* (2% inflation rate)**	**6.7%**

Source: *Frontier Economics*
Note:* *The output using the Fisher equation is 6.6%.*

2.1.7 The key input from the NGG 2073 hybrid bond was the spread value of 151bps (item 1 in the table above). This was the spread above iBoxx at the time the hybrid bond was issued.[17]

2.1.8 This figure of 151bps was compared to other GB utility spreads at issue – the purpose of which was to check that the value used was within standard ranges for this type of security. The finding was that 151bps was very similar to the average of the other two NG outstanding hybrid bonds and was lower than spreads at issue observed on SSE's hybrid bonds. This provided confidence that the value was comparable, and perhaps even conservative relative to some other data points.

2.2 Points raised in the SSMD

2.2.1 In its methodology decision, Ofgem welcomed the approach using hybrids, but expressed concerns regarding the evidence provided, for example:

- Ofgem stated that our analysis focused on evidence from the National Grid June 2073 hybrid bond and made assumptions that may not apply to regulated networks.

  "*The evidence focuses primarily on the analysis of a hybrid bond issued by one company (NGG Finance plc), and makes*

[17] Based on the yield to next call date.

> *general assumptions about the characteristics of hybrid debt that may not be representative the specific situations faced in the heavily regulated network sectors.*" [18]

- Ofgem also stated that hybrid bond yields cannot be consistently used to infer the right level of equity returns due to changing levels or inaccuracies.

> "*We also do not agree that it is possible to consistently 'back solve' specific required returns on equity from debt pricing because of changing levels or inaccuracies when assessing debt and equity risk premia over time.*" [19]

2.2.2 In this update we address Ofgem's comments, and check our estimates for robustness, by:

- extending our sample size of hybrid bonds to those issued by European utilities to further test the representativeness of the National Grid bonds used; and
- considering data from that sample over a number of years to explore the time consistency of hybrid bond spreads.

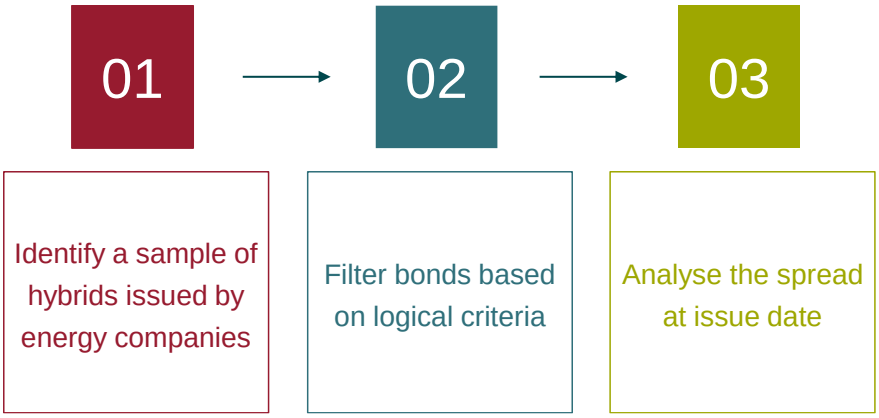
2.3 Further robustness checks

2.3.1 As noted in the previous subsection, our Investability Report had already compared the data from the NGG 2073 hybrid bond to other GB utility hybrid bonds. No issues were identified in that process. Nevertheless, in order to further test the robustness of the National Grid bond spreads used in the cross-check we follow a three steps process. This is set out in Figure 5 below. Each step is discussed in turn.

18 Ofgem (2024), 'RIIO-3 Sector Specific Methodology Decision – Finance Annex', para. 3.270.

19 Ofgem (2024), 'RIIO-3 Sector Specific Methodology Decision – Finance Annex', para. 3.270.

Figure 5 Robustness check steps



Source: Frontier Economics

Identifying a sample of hybrid bonds issued by energy companies

2.3.2 We have identified a sample of 86 hybrid bonds issued by 25 European utilities (see Annex A for details). This sample was obtained from Bloomberg by screening for securities which:

- Are identified as hybrid bond as their security type;
- Are issued by companies based in Western Europe; and
- Have a BICS Classification of 'Utilities and power generation'.[20]

2.3.3 Having identified this sample we gathered data on each bond's maturity, issue date, first call date, next call date, credit rating, currency, amount issued and yields at and since the issue date. This is to allow us to understand the key features of each bond and apply filters.

2.3.4 This sample includes companies that are present in different parts of the energy supply chain. We have widened the scope of activities within the sector because not all 'pure-play' network companies issue hybrid bonds.

Filter bonds based on logical criteria

2.3.5 We then apply a filtering process to this long-list of 86 bonds. This is to ensure that we are drawing on data that is broadly comparable to the GB hybrid bonds we considered in our Investability Report. The filtering also removes bonds which are likely to provide less relevant results.

[20] BICS is a Bloomberg industry classification standard. This screening captured some groups which also own gas utility assets. We checked whether separately including a gas utilities criteria could alter the sample, but the set of bonds from adding that criteria were already captured by the initial sample.

2.3.6 The filtering was based on the following four criteria:[21]

- GBP or Euro denominated bonds: given this is the currency of the existing GB hybrids considered.
- Bonds with maturity above 60 years:[22] this focuses on bonds with very long tenors – aiding comparability to equity.
- At least 5 years between the issue and the first call date: ensuring that the yield to the next call at issue reflects a time period at least as long as a typical price control period.
- Ratings in the range of [BBB-, BB+]: ensuring comparability with the NGG 2073 hybrid bond.

2.3.7 The filtering we applied resulted in a list of 55 remaining bonds issued by 16 different utilities (set out in Annex A).[23] We rely on this filtering process to support comparability – and use spread data from these 55 bonds as a reference point for checking the NGG 2073 hybrid bond spread at issue of 151bps.[24]

Analyse the spreads at issue date

2.3.8 In the figure below we plot the spreads at issue across the sample of all 55 hybrid bonds. This is compared to the equivalent figure for the NGG 2073 hybrid bond of 151bps (shown by the dashed line).

2.3.9 Overall, we find that **the average across the sample, 148bps, is very similar to the spread on the key NGG bond**.[25] The figure also shows that 80 percent of the observations are within the range of 100bps to 213bps (shown by the shaded area).

21 We discarded an additional filter based on the amount issued because it did not change the sample.

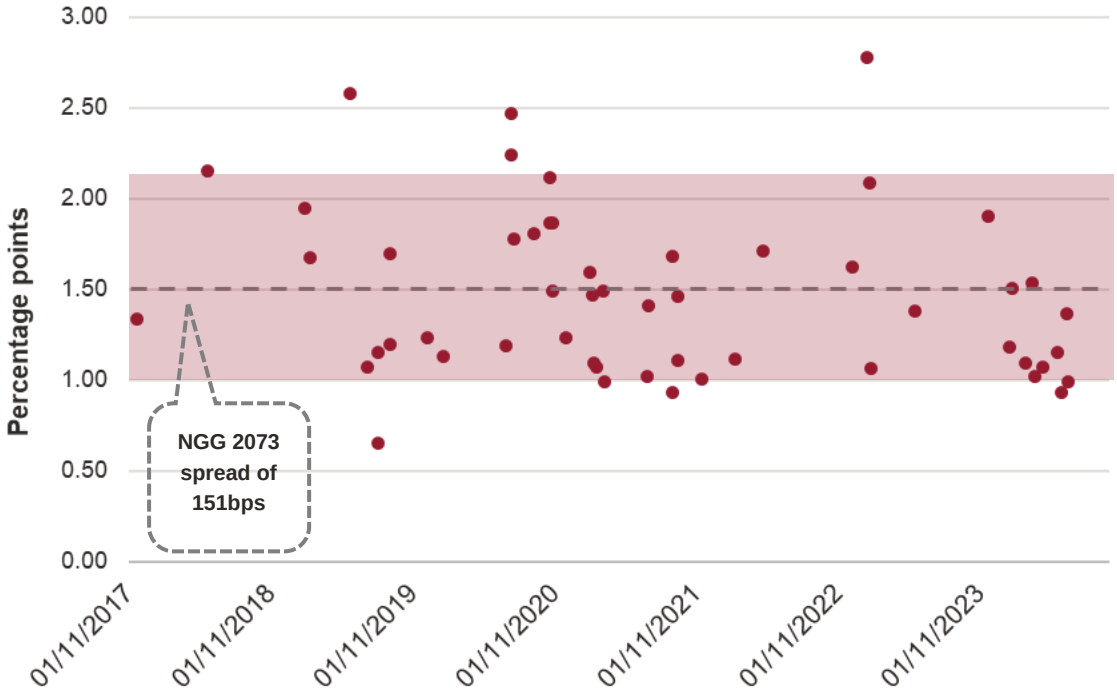
22 This excludes only two bonds.

23 The sample of 55 also includes the dropping of observations where the necessary data was not available.

24 We have not reviewed the characteristics and contractual details of each hybrid bond in the sample, although we have found that rating agents consider a large proportion of them to be 50% equity credit (matching the NGG Finance Plc bonds).

25 We compare spreads from bonds denominated in EUR and GBP on a like-for-like basis. We also note that while the GBP iBoxx indices are available at a range of maturities, the EUR utilities index is a single blended index. Nevertheless, the typical average time remaining to maturity on the EUR utilities index is an approximate match to many of the time to first call dates at issue in the hybrid bond sample.

Figure 6 Spreads to iBoxx at issue for the wider hybrid bond sample



Source: *Frontier Economics, Bloomberg, S&P Global*

Note: *The spread is based on the iBoxx € Utilities for EUR bonds, and the iBoxx GBP Utilities 5-7Y, 7-10Y and 10-15Y (depending on currency and the years between the first call date and the issue date). We use iBoxx data from same date as the issue date.*

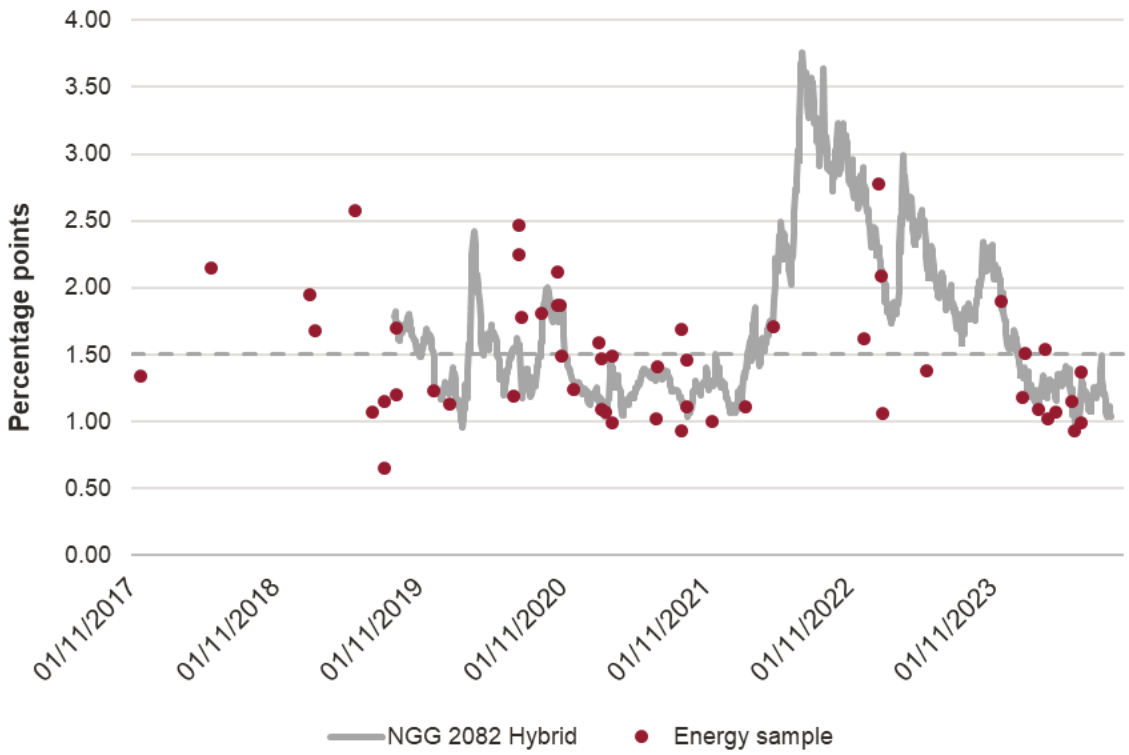
2.3.10 The chart shows that the hybrid yields at issue are consistently above the relevant iBoxx utilities index yield i.e. the spread is always positive. This reflects the relative risk profile we would expect for these securities and supports the logic and findings of our cross-check.

2.3.11 Overall we find that this supports the National Grid bond as a robust observation, consistent with peers in its asset class. This supports the cross-check conclusions applied to date. **There is no concern from this analysis that the National Grid input used is notably high or low for a hybrid bond issued by a utility company**.

2.3.12 To further explore the relationship between hybrid bonds issued by National Grid and the wider market we also show in Figure 6 below how the traded spread of

the NGG Finance Plc 2082 bond compares with the spreads at issue in the sample.[26]

Figure 7 Spreads to iBoxx at issue compared to NG traded spread



Source: *Frontier Economics, Bloomberg, S&P Global*

Note: *The spread is based on the iBoxx € Utilities for EUR bonds, and the iBoxx GBP Utilities 5-7Y, 7-10Y and 10-15Y (depending on currency and the years between the first call date and the issue date). We consider the same date as the issue date.*

2.3.13 As shown, the traded spread of the National Grid bond has moved broadly in line with the other spreads in the market. It also shows that there were fewer issuances during the period where the relative cost of hybrid bonds, as demonstrated by the National Grid bond, was at a recent high point for the sector (in 2022).

2.3.14 More recently, as the relative cost has lowered, there have been increased issuances. The National Grid bond traded spread has tracked this pattern in the wider market.

[26] We select this NGG Finance Plc bond for this comparison as it has the furthest time remaining to next call date out of all the NGG Finance Plc bonds – making it the most comparable to the wider sample. The bond has a call date of June 2027. By contrast the NGG Finance Plc 2073 hybrid bond has a next call date of June 2025, meaning that towards the end of the sample the remaining tenor is less comparable to the spreads at issue on other hybrid bonds (which have a tenor of at least five years). When using spread at issue data we prefer the 2073 bond as this bond has the longest tenor to first call date at issue (over 12 years) out of all NGG bonds.

2.3.15 Again, **we find that this shows there is nothing unusual about the NGG Finance hybrid bonds the cross-check draws upon** – and that those bonds are consistent with other comparable hybrid bonds in the market.[27]

2.4 Updated outputs

2.4.1 In this subsection we provide an updated set of outputs for the hybrid bond cross-check. Given we find that the 151bps spread at issue input is a robust value, the update is focused on reflecting the latest iBoxx utilities index data.

2.4.2 Table 1 below shows that the **output for the start of September 2024 is 6.6%**, this is the same as the value of 6.6% set out in our Investability Report.[28]

Table 1 Updated hybrid bond cross-check outputs

Component	Sep-2024 update
Spread to iBoxx (adjusted for default risk, at issue)	+136bps
Equity-likeness %	50%
Higher returns on equity	+272bps
iBoxx £ Utilities 10Y+	5.99%
Nominal equity returns	**8.7%**
CPIH-real equity returns (2% inflation)	**6.6%**

Source: *Frontier Economics*
Note: *Spread before adjustment is 151bps, 15bps then netted from this figure for default risk; iBoxx value a 1yr average*

2.4.3 As in our March 2024 Investability Report, to provide further comfort around these results, we have undertaken a set of sensitivity tests on the key assumptions of the analysis.[29] Although the details are not discussed here, the results from those checks for the start of September 2024 are shown in Table 2 below.

27 Our work shows that hybrid bonds are a relatively common security for large energy utility corporates to use in Europe.

28 Comparing both fisher equation deflated values.

29 The details of these can be found in our Investability Report.

Table 2 Updated hybrid bond cross-check range

Summary results	Low	High
Sensitivity on historical hybrid-iBoxx spread	7.7%	10.0%
Sensitivity on the percentage of equity-like	7.8%	11.4%
Sensitivity on iBoxx averaging	8.3%	10.1%
Nominal equity returns (average of sensitivities)	**7.9%**	**10.5%**
CPIH-real equity returns (2% inflation)	**5.8%**	**8.4%**

Source: Frontier calculations

Note: Results for the cost of equity range are obtained by a simple average of the low and high values of each sensitivity column respectively. We consider a 2% inflation assumption to derive CPIH-real cost of equity

2.4.4 As shown, the sensitivities are used to derive a range around the central CPIH-real CoE of 6.6%. Overall, this results in a **low end of the range from the cross-check of 5.8%**, and a **high end of the range from the cross-check of 8.4%**. We note that our point estimate is closer to the lower end than the upper end – this simply reflects the non-symmetric outputs from the sensitivity analysis.

2.5 Implications for the RIIO-3 CAPM

2.5.1 As set out at the start of this section, the hybrid bond cross-check is a highly valuable measure by which regulators can conduct an investability test on the allowed rate of equity return. Given the conclusions of section 2.1 above, we continue to find that the data used in the cross-check is robust to wider checks, mitigating concerns raised by Ofgem in the SSMD.

2.5.2 The cross-check is less suited to being a primary tool for estimating the regulatory allowed return on equity given the outputs can vary over time with prevailing debt market prices (and therefore may not provide the requisite stability the UKRN guidance seeks).

2.5.3 The cross-check is predominantly a tool for testing whether there may be heightened investability risks at a given point in time with a specific set of CAPM values.

2.5.4 We consider that risks to investability are heightened where the CAPM mid-point lies below the hybrid bond cross-check range. A lack of overlap can be taken as a signal that the CAPM values may have fallen out of line with prevailing market conditions.

2.5.5 Given the updated outputs set out above, we would therefore consider that investability risks were heightened where the CAPM mid-point is below 5.8% (CPIH-real). Based on the figures set out in the SSMD, where the 'Step-1 CoE

(early view)' had a mid-point of 5.46%, we consider that there are outstanding investability risks for Ofgem to address.

2.5.6 Further, we consider that to address these risks, Ofgem could revisit the estimation of certain CAPM parameters, consider where in the range values are selected from, or a combination of both. The end result should be a point estimate that sits comfortably above the lower bound of the hybrid bond cross-check range (5.8%) towards the point estimate (6.6%).

2.5.7 Later in this report (Part 2) we explore a set of TMR cross-checks to show how Ofgem's TMR range and point estimate are contributing to the overall CoE to failing this investability test.

3 Infrastructure fund implied equity IRR

3.1 Ofgem's application at RIIO-2

3.1.1 At RIIO-2, Ofgem obtained discount rates for a set of infrastructure funds that invest in private finance initiatives and private utility assets.[30] It then inferred an IRR for each fund by deflating the discount rates by the premium-to-net asset value (NAV) for each fund to account for outperformance of the underlying assets. Ofgem then took a simple average across the funds to derive a point estimate of 6.3% nominal, which was converted to 4.2% CPIH-real.[31]

3.2 Points raised in the SSMD

3.2.1 Ofgem noted that the December 2023 update set out in our Investability Report showed an increase to 9.6% nominal in December 2023. Ofgem did not specifically discuss the implications of the figures. However, it did provide a brief statement on the cross-check which said:

> *"In relation to the infrastructure fund implied equity IRR cross check, it is important that we make our cross-checks as useful and relevant as possible, but do not 'cherry pick' only those that provide a certain view for each control. We will consider if and how a simple and objective infrastructure fund implied equity IRR cross check can best be applied, and will provide further details on this at DDs as appropriate."*

3.2.2 In the remainder of this section we set out updated outputs to September 2024 and our view on what the implications of the infrastructure fund implied equity IRR cross-check are for the RIIO-3 CAPM.

3.3 Updated evidence

3.3.1 We have collected up-to-date data on the discount rates for the relevant infrastructure funds and carried out the same NAV premium adjustment, in order to present as far as possible a like-for-like comparison with the previous application of the cross-check.

3.3.2 The sample has evolved due to funds closing, being renamed or data no longer being available. Our figures are based on a sample of nine funds where consistent data was available.

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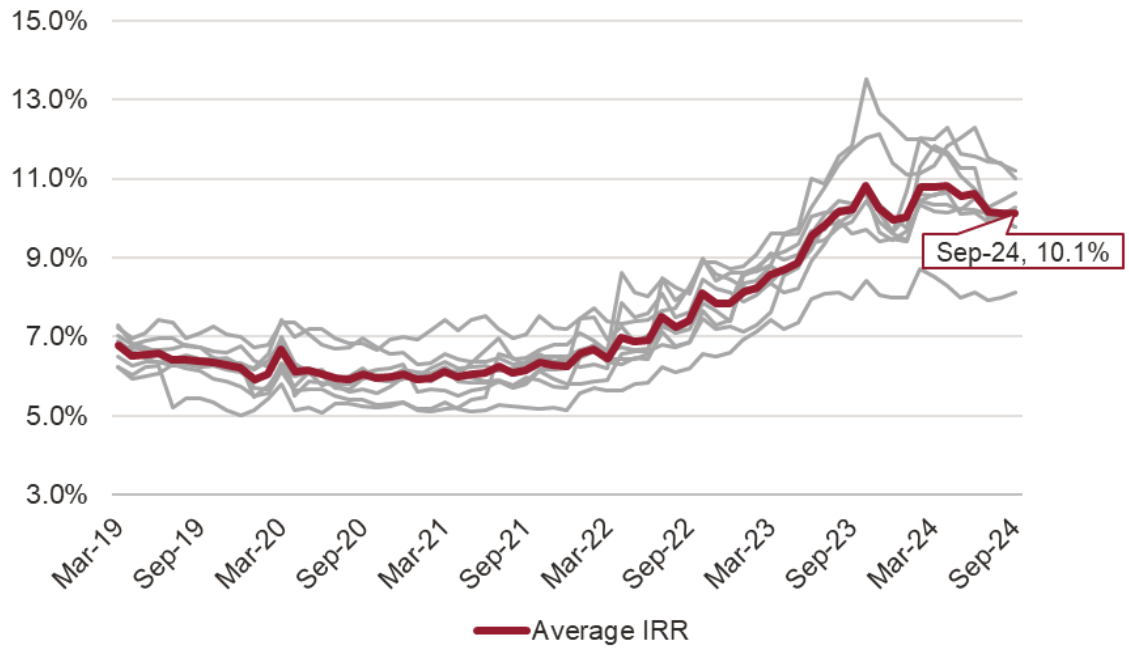
30 Ofgem included 14 funds in its review, but excluded one fund (3i Infrastructure) from its calculation of the average IRR. This means that 3i infrastructure as not included in Ofgem's cross-check point estimate.

31 Ofgem (2020), RIIO-2 Draft Determinations - Finance Annex, para 3.93-3.96.

3.3.3 The monthly equity implied IRR for these funds are shown in the figure below. The graph shows that the average equity implied IRR has increased from 6.0% in July 2020[32] to 10.1% in September 2024 (i.e. an increase of 4.1 percentage points over this time). We adopt this as our headline figure for this cross-check. This is approximately 8.0% in CPIH-real terms.[33]

Figure 8 Nominal infrastructure fund implied equity IRR



Source: *Frontier Economics analysis on Bloomberg data and published reports*

Note: *Analysis as of Sep 2024 using the most recent discount rate in annual reports. The analysis excludes 3 funds considered by Ofgem in RIIO-2 (i.e. GRP, JLIF and JLP). For GRP, we have not been able to find the updated net asset value data throughout the period. JLIF and JLG were sold to investment firms in September 2018 and 2021 respectively. We have excluded Greencoat UK Wind (i.e. UKW) series due to a change in the company reporting that made the previous analysis irreconcilable.*

3.3.4 As of September 2024, all the individual funds showed an increase in implied IRR since March 2019, with the smallest increase being 2.6 percentage points (BBGI) and the largest increase being 5.5 percentage points (JLEN, recently renamed as FGEN).

3.4 Implications for the RIIO-3 CAPM

3.4.1 We have previously raised a number of critiques with this cross-check. Nevertheless, Ofgem is considering how it could best be applied for RIIO-3.[34] We

32 Ofgem concluded 6.3% at RIIO-2.

33 Using a CPIH inflation assumption of 2%.

34 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.269

therefore set out our views on what implications for the RIIO-3 CAPM can most suitably be drawn from this evidence.

3.4.2 We consider that the equity IRR evidence is most suited to understanding trends in market conditions over time. This is because a consistent time series of data for multiple funds can be observed.

3.4.3 Its application as a cross-check is therefore more informative on whether the CAPM values from one period (or price control) to another are consistent with the trends in the market. This is particularly important to consider where movements in the data have been significant.

3.4.4 However, it is important to exercise caution when interpreting the returns of specific funds, as some funds will include some debt, which reduces their comparability with equity. Ofgem adjusts for this such that it can compare all funds on an unlevered basis, but de-levering the returns necessarily requires making some assumptions, which impacts the robustness of this cross-check.

3.4.5 Based on the evidence above, we find that an upward movement of over four percentage points since 2020 (the time of the last RIIO-GD2/T2 decision) is a highly significant movement to consider. As Ofgem itself highlighted, the allowed equity return needs to reflect the market CoE in order to secure investment in regulated utilities. The evidence is therefore suggestive of the CAPM values between RIIO-2 (GD/T) and RIIO-3 (GD/T) also needing to move in the same upward direction.[35]

3.4.6 We do not consider that the CAPM values need to adjust on a one-for-one basis with this cross-check. But, if the absolute value from the CAPM range is significantly different from this cross-check output (multiple percentage points) then a robust explanation is required to preclude its application and influence. In this case, the infrastructure IRR evidence is now approximately 4 percentage points higher than when Ofgem examined similar evidence at RIIO-2. At the same time, Ofgem's RIIO-3 CoE range is only around 1% higher compared to its RIIO-2 decision. Therefore, there is a question of whether Ofgem's CAPM range is in line with the current infrastructure IRR evidence.

[35] Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.265

4 MARs

4.1 Ofgem's application at RIIO-2

4.1.1 At RIIO-T2/GD2, Ofgem referred to market-to-asset ratios (MARs) as one of three cross-checks that implied equity returns at or below 4.2%.

4.1.2 Broadly, Ofgem estimates the MARs of GB regulated utilities by computing the ratio of the 'regulated' enterprise value (EV) over the regulated asset base (RAB) of each company. If this value is above '1', Ofgem infers that this 'premium' must be driven by a combination of outperformance (e.g. on totex, outputs or debt) and the regulated allowed return on equity being above the true CoE. Using a stylised inference model it calculated a 'true cost of equity' for a given MAR and expected out(under)performance.[36]

4.1.3 There are two types of MARs Ofgem employs in this cross-check: transaction MARs and traded MARs, which relate to two different data sources Ofgem can draw on to estimate the EV of regulated utilities. [37]

- Traded MARs are derived on the basis of traded share prices and reported debt values of the four publicly traded utilities. This is available for Severn Trent (SVT), United Utilities (UU), Pennon (PNN) and National Grid (NG).
- On the other hand, transaction MARs are derived on the basis of transaction prices of privately held utilities e.g. the recent transaction of Phoenix Gas and Electricity North West (ENWL), both of which completed earlier this year.

4.2 Points raised in the SSMD

4.2.1 In its methodology decision, Ofgem set out that it will continue to consider the MAR as one of its CAPM cross-checks.

4.2.2 Ofgem also states that it agrees with the CMA's view that MARs are *"unlikely"* to support a "*precise*" decision on the allowed equity return. However, it would be "*difficult*" to accept that large MAR premiums can be justified by "*assumptions other than higher than required allowed returns or lengthy and consistent expected outperformance*".[38]

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36 Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA', Section 6.4.1

37 There are various adjustments which need to be applied to the enterprise values from traded share prices and transaction prices that pertain only to the regulated entity, such that these 'market prices' can be compared to the regulated RAB. Ofgem's approach to these adjustments is outlined in Chapter 6.4.1 of our March 2024 Investability Report, prepared on behalf of the ENA.

38 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.266.

4.2.3 In addition, Ofgem also discusses its scepticism surrounding the existence of a "*winners curse*" or investors factoring in *"synergi[es]"* in relation to transaction MARs.[39]

4.2.4 In the sections that follow, we assess the MAR cross-check and provide a view on the points raised by Ofgem in the SSMD. We also present updated evidence for Ofgem's consideration.

4.2.5 Importantly, we continue to be concerned about the integrity of this cross-check. We set out critical caveats in section 4.1 that Ofgem should take note of if it intends to put weight on MAR evidence.

4.3 Assessment of the MAR cross-check

4.3.1 Fundamentally, Ofgem's CoE inference based on MAR evidence relies on the market's valuation of utilities[40] to draw inferences about the how investors perceive the regulatory settlement.

4.3.2 Ofgem presumes that if the market value of regulated utilities is larger than their regulated asset value (RAV), Ofgem takes this as an indication that investors expect utilities to generate future benefits to investors beyond the baseline allowed return. These returns can be delivered by beating regulatory targets (outperformance), enhanced by growing the RAV; or, because the allowed return is higher than utilities' 'true' CoE. If one believes markets are reasonably efficient (i.e. investors behave rationally and have good information on which to base their valuation), then MAR ratios could reflect utilities' prospective future returns.

4.3.3 The main challenge associated with this cross-check lies in drawing inferences about utilities' 'true' CoE based on the market valuation as there are multiple unknowns that drive valuation, with true CoE being only one of them and others including the expected future baseline allowed return, outperformance enhanced by RAV growth and any upward bias in pricing from private transactions. In other words: it is extremely challenging, if not impossible, to explain precisely *why* MAR premia are at their observed levels.

4.3.4 To infer the 'true' CoE from the MAR, we need to understand investors' combined assumptions on both outperformance *and* RAV growth in perpetuity. These assumptions - which underly investors' valuations - cannot be known (as they remain private information) even under relatively efficient markets, and this introduces significant 'noise' into the inference exercise. Furthermore, in reality,

39 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.266.

40 The enterprise value is the market value of a firm.

market and informational imperfections exist, and therefore call into question the value of the CoE inference exercise.

4.3.5 The uncertainty discussed above applies to both traded and transaction MARs; however, transaction MARs particularly suffer from this, while traded MARs contain at least a lower degree of uncertainty as frequent trading in liquid markets would promote more transparency and information discovery.

4.3.6 In fact, it is likely that transaction prices of private utilities are biased upwards. In the sale of privately held regulated utilities, there is usually a single seller and multiple buyers. Under such circumstances, the rational outcome (from a sellers' perspective), is to transact with the bidder that offers the highest price.

4.3.7 Therefore, bid prices will reflect investors' views of future cash flows *and* an uplift to ensure their bid is accepted over other offers, which results in this upward bias of transaction prices (and MARs). We note that Ofgem stated that evidence from competitive processes is preferred when estimating cost of capital,[41] we consider that competition on both buy-side and sell-side are important in a transaction.

4.3.8 Making inferences on the CoE (or indeed the broader regulatory package) on the basis of transaction MARs would almost always lead to the conclusion that the CoE allowance and/or the regulatory settlement is more 'generous' than it is, when in fact transaction MARs are influenced by the normal bidding process carried out in most, if not all, private transactions.

4.3.9 To address Ofgem's point raised in its SSMD on the absence of a 'winners curse' and how investors account for potential synergies; given the nature of transaction processes, it would be unreasonable to suggest that the MARs are not influenced by asymmetry in the numbers of buyers and sellers or consideration of outperformance that is driven by synergies with existing activities of the winning bidder. This element must be considered when Ofgem executes the cross-check on the CAPM range.

4.3.10 Overall, we consider there are significant challenges associated with CoE inference using MARs. This does not even consider the difficulty in estimating the MAR ratio itself, which requires 'carving out' the EV of the regulated business from the reported group EV for some utilities (e.g. NG), as we described in paragraphs 207 onwards in our Investability Report.[42] This exercise requires making a number of assumptions on how net debt and equity market capitalisation are allocated between regulated and unregulated businesses, and

41 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.267.

42 At this point in time, among the traded Utilities, estimating the GB regulated EV for National Grid is particularly difficult given NG's diversified nature. In reality the business is run as a group and allocating net debt to the UK and US business is necessarily assumption driven and does not reflect how resources are deployed in reality.

cannot be done with complete accuracy when a company operates under a conglomerate model.

4.3.11 In conclusion, there are many structural and practical sources of uncertainty associated with Ofgem's MAR cross-check. But, we understand Ofgem's objective to monitor the development of MAR ratios over time. In particular, the evolution of traded MARs, observed over the appropriate time window, may provide some signals on how the regulatory settlement balances the interests of customers and investors.

4.3.12 Specifically, the most appropriate time frame for assessing traded MARs[43] is when regulators have released definitive information on the likely regulatory settlement; and, when there is relatively accurate, up-to-date accounting data to support the estimation of the regulated EV.

4.3.13 For example, at the time of writing of our Investability Report, we did not have the relevant information on a reasonable market expectation of an allowed return on equity going forward. However, at the current time, it is feasible to conduct MAR analysis of water companies, given Ofwat has released the PR24 Draft Determinations (DDs), and there is relatively up to date accounting and market capitalisation data which can be used to estimate the enterprise value of water networks.[44] This is not the case for National Grid, however.

4.3.14 Earlier this year (June 12, 2024), i.e. before the SSMD was published, National Grid conducted an equity rights issue. As a result, NG's cash position (and thus, its net debt) will have changed significantly, and is not reflected in the latest available accounting data (for the financial year ending 31st March 2024) as of the date of completion of this report.

4.3.15 It is also important to note that conducting any inference without appropriately considering for NG's EV and MAR post-rights issue would be misleading, and we would caution against conducting this analysis at this point in time.[45]

4.3.16 With regards to transaction MARs of Phoenix and Electricity North West (ENWL), we consider the requisite data exists to execute Ofgem's MAR inference. While specific transaction timelines are not public information, it is clear that the Phoenix transaction completed under the GD23 settlement. Given the ENWL transaction completed in August, it would be reasonable to assume that those

43 Although the inference needs to be treated with caution to address inherent uncertainty

44 We can consider current market capitalisation and accounting data for the year ending 31st March 2024.

45 We expect an updated cash position to be published in the half year accounts, expected to be published in November 2024.

prospective investors had an opportunity to consider Ofgem's SSMD (published 18th July) ahead of submitting their binding offers.

4.3.17 We present updated MAR ratios in the following section.

4.4 Updated evidence

4.4.1 The table below sets out the latest evidence on MARs, which we have updated according to the methodology set out in our Investability report. The table below shows that traded utility MARs have not moved significantly since our previous review of the evidence in our Investability report.[46]

Table 3 Traded Market-to-asset ratios

Utility	MARs estimated using book value of debt	MARs estimated using market value of debt
United Utilities	1.11	1.09
Pennon	0.87	0.85
Severn Trent	1.19	1.15
Water average	**1.06**	**1.03**

Source: *Frontier calculations using data from Bloomberg and company annual reports. Pennon includes SES Water*

Note: *Value of debt is as the financial year ending 31st March 2024 –the latest available update from company reports. We source this information from annual reports as we consider annual reports to be the most comprehensive record of net debt outstanding, except for National Grid for reasons discussed in the previous section. For water companies, market capitalisation data is drawn from 30th September 2024. It is not possible to estimate a representative MAR for National Grid at the moment, due to a lack of information on its latest net debt post- rights issue. We have therefore not included this observation in the table.*

4.4.2 In addition to the traded MARs set out above, we also consider the transactions involving Phoenix Gas and Electricity North West that completed earlier this year. Based on publicly available information, we estimate the MARs from these transactions are 0.95 and 1.64 respectively.

4.4.3 In summary, recent evidence (excluding National Grid) suggests a wide range of MARs, from 0.85 (Pennon) – 1.64 (ENWL).

4.4.4 Using Ofgem's MAR inference model deployed at ED2,[47] as well as a range of plausible assumptions around RAV growth, outperformance, and the allowed CoE, we find that this exercise yields an implied CoE range of 4.90% - 12.33% CPIH-real.[48] Full assumptions and the resulting inference are detailed in Annex B

46 Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA'.

47 Ofgem (2022) RIIO-ED2 Draft Determinations – Finance Annex, Table 16

48 For reasons discussed in the previous section, this range does not cover an implied CoE derived from NG MAR.

and C. We have formed our assumptions based on outturn values, company business plans, and regulatory determinations, and we employ Ofgem's inference model from RIIO-ED2.[49]

4.4.5 In fact, we observe that a range of outperformance and RAV growth assumptions can result in the MARs observed, even if we assume that the actual CoE is equal to the allowed CoE and ignore any other factors that may contribute to the MAR. We have derived this observation based on Ofgem's MAR inference model, and we show these illustrative results in the table below.

Table 4 Illustrative MAR resulting from different combinations of outperformance and RAV growth assumptions, and assuming no difference between the actual and allowed CoE

		Real RAV growth (%, p.a.)					
		0.0%	**1.0%**	**2.0%**	**3.0%**	**4.0%**	**5.0%**
Outperformance (% RoRE p.a.)	**-1.00%**	0.93	0.91	0.88	0.84	0.73	0.13
	0.00%	1.00	1.00	1.00	1.00	1.00	1.00
	1.00%	1.07	1.09	1.12	1.16	1.28	1.88
	2.00%	1.15	1.18	1.23	1.33	1.55	2.76

Source: Ofgem, Frontier analysis

Note: To operationalise the illustrative analysis above, we have considered the midpoint of Ofgem's allowed equity return from its early view in the RIIO-3 SSMD. For the avoidance of doubt, the MARs shown in this table are unrelated to actual observed MARs set out in the earlier paragraphs in this chapter.

4.4.6 The table above demonstrates that there does not need to be a difference between the actual and allowed CoE for the MAR to be above '1'.

- For example, when we consider high growth sectors such as electricity distribution, a positive MAR can be expected, even if coupled with a modest amount of outperformance. For such a sector, 4% - 5% growth may not be unusual.[50]
- On the other hand, minor outperformance, coupled with moderate RAV growth (e.g. 2% - 4% p.a.) would also plausibly lead to a MAR larger than 1, even if the allowed CoE is perfectly equal to the actual CoE. This could plausibly characterise some of the water sector traded MARs currently observed.

49 See for example: Ofgem (2022) RIIO-ED2 Draft Determinations – Finance Annex, Table 16

50 See Appendix B and C, for assumptions underlying ENW's prospective growth and inference. Not only that; we note that for ENW, there could be other factors (beyond the regulatory settlement) which would influence the MAR. We discuss this in Annex C.

4.4.7 Given that a range of plausible assumptions produces a very broad CoE range of about 8%, it is clear there is inherent difficulty in using MAR to infer the CoE. Even then, we have shown that even assuming zero CoE outperformance it is possible to explain some of the higher MARs based on reasonable growth and outperformance assumptions. Therefore, we caution Ofgem from putting undue weight on this evidence if Ofgem decides to nevertheless consider the MAR evidence.

4.5 Implications for RIIO-3 CAPM

4.5.1 We continue to believe that MAR inference is a cross-check subject to a significant degree of uncertainty due to the assumption driven nature of this cross-check.

4.5.2 We recognise that all cross-checks (indeed all analysis) rely on some degree of assumption. However, we note that the MAR cross-check is very assumption-driven compared to the other cross-checks discussed in this report. We also observe that there is a wide range of plausible assumptions on growth and outperformance that can be made, which are well supported by available evidence. But this wide range of plausible assumptions is borne out in the wide range of implied CoE from the inference exercise, which calls into question the informational value of the inference exercise.

4.5.3 For this reason, and the other practical reasons mentioned above, we have concerns about the integrity of this cross-check and therefore caution Ofgem not to put undue weight on the MAR inference. This is particularly true for MAR evidence from private transactions, as there are further issues with the prices achieved in these transactions due to the non-competitive nature on the sell side which could lead to over-pricing of the asset.

4.5.4 However, if Ofgem nevertheless wants to consider the MAR evidence, then we think that Ofgem should only consider publicly traded MARs with input assumptions available in the public domain.

5 Long-term profitability benchmarking

5.1.1 As set out in our Investability report, we consider it is reasonable for regulators to assess how the allowed equity return compares to the outturn level of profitability for comparable businesses (i.e. businesses with a similar aggregate risk profile as energy networks). This provides a useful real-world check on whether or not the allowed return for regulated companies is reasonable (or potentially too high or too low).[51]

5.1.2 Profitability metrics of utilities can be a useful real world check of stable returns, although these metrics may not be fully comparable to GB regulated utilities due to different risk profiles and regulatory environments.

5.1.3 Ofgem casted doubt on the validity of this cross-check in the SSMD, citing:

- Businesses and sectors contained in this cross check are "materially riskier" than regulated utilities;
- "substantial difficulties" in comparing accounting metrics with regulatory return metrics; and
- "significant issues" in controlling for the different levels of gearing used in the comparators.[52]

5.1.4 Although we recognise all of these issues as limitations of this cross-check, we consider Ofgem's total dismissal of the informational value of this cross-check is unwarranted. This is because some of Ofgem's own cross-checks suffer from very similar challenges, for example:

- OFTO bid COE, infra fund IRR and investment manager surveys all have data that are based on gearing levels that are not easy to control for;
- Infra fund IRR and investment manager surveys also suffer from similar issues with imperfect comparability in terms of risks as these are not always regulated utilities;
- And the various data issues we have explained in detail on MAR cross-checks that Ofgem appears to rely heavily upon.

5.1.5 Regarding the criticism on accounting data versus regulatory return metrics, it is hard to see why the difference would be irreconcilable to such an extent that the data is unusable.

5.1.6 Overall, we consider profitability metrics are a helpful reference point to ensure the CAPM-CoE point estimate falls within a reasonable location of the range of

51 Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA', Section 6.5

52 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.273.

long-term average profitability metrics. If the CAPM-CoE range sits outside the range of outturn profitability of other utilities, this may be an indication for regulators to review CAPM parameter ranges to ensure they are comfortable with judgements made in their estimation.

5.1.7 Given the long-term nature of this cross-check, we do not consider that it is necessary to provide an updated figure in this report, and the ranges cited in our Investability Report remain relevant. A range of 5.9% - 8.4% should be considered as a result of this cross-check.[53]

[53] Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA', para. 258 and Table 13

6 Review of CoE cross-check evidence

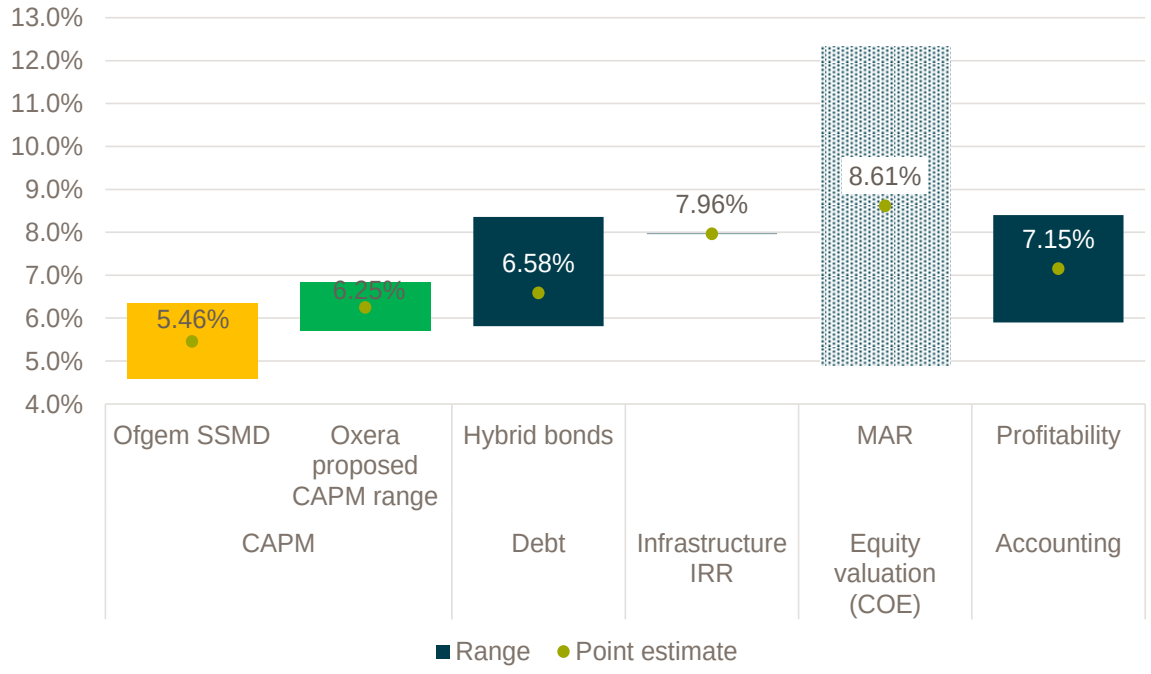
6.1 Summary of the CoE cross-check results

6.1.1 This section sets out a summary of the results of all of the CoE cross-checks discussed in this report, including the cross-checks recommended by Ofgem as well as Frontier.

6.1.2 The overall finding of these cross-checks is that the CoE proposed in Ofgem's SSMD Step 1 CAPM range is too low. Furthermore, the midpoint of Ofgem's range will not satisfy its equity investability objective. As our TMR cross-checks reveal (Part 2 of this report), an important part of the reason for this is that Ofgem's TMR range is too low.

6.1.3 We have discussed updated evidence of selected cross-checks in the previous sections of the report, and these are summarised in the chart below.

Figure 9 CoE estimates and cross-checks (CPIH-real)



Source: *Ofgem, Frontier Economics, Oxera*
Note: *We consider a 2% CPIH assumption and the Fisher equation to derive CPIH-real values for the cross-checks*

6.1.4 As shown in the figure above, our hybrid bond cross-check indicates that Ofgem's proposed RIIO-3 CAPM-CoE range is likely too low. In particular, the midpoint of Ofgem's range (5.46% in CPIH-real terms) lies well below the central

estimate of the hybrid bond cross-check, and is even below the lower bound of the hybrid bond cross-check range (5.80% CPIH-real).

6.1.5 Our latest point estimate of the hybrid bond cross-check indicates that an allowed equity return of 6.6% would be appropriate to ensure an investable equity package for RIIO-3. This is further supported by the other cross-checks, including those preferred by Ofgem, i.e. MAR inference and the infrastructure fund IRR.

6.1.6 Our result on the MAR inference analysis is based on Ofgem's model, using a wide range of plausible assumptions shows a range of 4.90% - 12.33%. We observe that although Ofgem's point estimate appears to be within this range, it is at the bottom end of a very wide range. In fact, our hybrid-bond cross-check point estimate of 6.6% is located at the lower end of this range. We do not intend to place too much weight on MAR inference due to its inherent uncertainty and very wide implied range. We consider it unlikely to be informative regarding whether or not Ofgem's proposed CoE is sufficient to secure investability.

6.1.7 The updated results for infrastructure fund IRR show a point estimate of 7.96%, which is also well above Ofgem's point estimate. However, as we explained above, we consider this cross-check most informative for informing changes over time rather than rather than the required level of CoE allowance. We note that in that context, the updated result for September 2024 is similar to our Investability report – there has been a significant (four percentage point) increase in the discount rate used by the infra-funds that Ofgem considered at RIIO-2 since that time. This indicates that a significant increase of the allowed equity return is likely to be required for RIIO-3.

6.1.8 We continue to believe that our long-term profitability cross-check, albeit imperfect, provides an indicative range of returns achieved by comparable sectors, and that Ofgem's SSMD point estimate is below our range.

6.1.9 Furthermore, even though we do not have updated analysis, we note that the ARP-DRP analysis presented by Oxera in its CoE report submitted to Ofgem in response to the SSMC also supported a significant increase in the allowed return on equity for RIIO-3 compared to RIIO-2.

6.1.10 The available cross-check evidence shows that the CoE range proposed in Ofgem's SSMD is too low and that the mid-point of Ofgem's range is inconsistent with most of the cross-checks. If left unchanged, this level of allowed equity return would not achieve Ofgem's stated objective of ensuring that the RIIO-3 price control package is investable for an equity investor.

6.1.11 We also find that Oxera's proposed CAPM range is more consistent with the cross-check evidence. In particular, Oxera's range is more in line with the range implied by the hybrid bond cross-check evidence.

6.1.12 A key contributor to the SSMD CoE range being too low is likely the TMR range proposed by Ofgem. This is explored in Part 2 of the report.

PART 2: TOTAL MARKET RETURN CROSS-CHECKS

7 Dividend Growth Model derived cross-checks

7.1 Our Investability Report and evidence on TMR cross-checks submitted at SSMC

7.1.1 In our Investability report, we set out the evidence of regulators explicitly lowering their estimate of TMR over time in response to the fall in gilt yields since the Global Financial Crisis (GFC).[54] We also noted however that regulators had not lowered TMR in response to the decline in gilt yields on a 'one-for-one' basis. Rather, regulators have adopted a 'stable but not fixed' policy. This policy has been explicitly endorsed by the UKRN.[55]

7.1.2 Importantly, we noted that the interest rate environment has now reversed, and the ultra-low, deeply negative real interest rates that may have influenced TMR decisions during those times no longer prevail. [56] The factors that Ofgem encountered at RIIO-2 when settings its low estimates of TMR are now pointing towards a need for Ofgem to increase materially its estimates of TMR at RIIO-3.

7.1.3 To provide evidence on TMR for Ofgem with their upcoming RIIO-3 decision, we formulated a 'TMR Glider' which is calibrated using historical market implied TMR based on a Dividend Growth Model (DGM) and historical prevailing interest rates (gilt yield) at the same time.[57] The Glider provides a more indirect reading on the required TMR based on current market conditions, but is moderated by the risk-free rate environment and is less subject to the more volatile movement of the equity market premium.

7.2 Points raised in the SSMD

7.2.1 Ofgem agrees with the 'stable but not fixed' principle but it did not consider that it should automatically uplift its figures relative to its RIIO-2 decision to reflect higher market rates of interest and/or RFR.[58] Ofgem instead attributes the decline in TMR values in RIIO-2 due to the transition to a CPIH-real regime (which led to TMR estimates which are lower in RPI-real terms).

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54 Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA', Section 2.1.1

55 Frontier Economics (2024), 'Equity Investability in RIIO-3 – A report prepared for the ENA', Section 2.1.3

56 For the avoidance of doubt, this refers to both real and nominal rates.

57 We developed this framework in our report prepared for National Grid Electricity Transmission at SSMC stage, titled: Frontier Economics (2024) The relationship between total market return and gilt yields. For ease of reference, we may refer to this report as 'Our TMR Glider' report in other sections of this report.

58 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision, Finance Annex, para. 3.95.

7.2.2 Regardless whether Ofgem acknowledges the role prevailing interest rates played on its RIIO-2 TMR decision, it is clear that the market-based forward implied TMR and underlying interest rates move broadly in the same direction. Our TMR Glider quantifies the relationship between these two variables. In other words, the Glider allows us to estimate a TMR that reflects the market interest rate.

7.2.3 We remain of the view that this analysis provides a constructive lens through which to interpret the UKRN's 'stable but not fixed' TMR policy.[59] We consider it a valuable cross-check of the TMR estimate from Ofgem's Step 1 estimation, which is based entirely on long-term historical averages, and completely disregards more up-to-date, contemporaneous market evidence.

7.2.4 In the sections that follow, we present various TMR cross-checks that have been presented directly in regulatory consultations to date.

7.2.5 First, we provide updated evidence on DGM-based TMR evidence i.e. DGM estimates of TMR themselves, and updated estimates derived from our TMR Glider. We reflect on the DGM-based evidence alongside the long-term historical average, to assess the extent to which Ofgem needs to adapt its RIIO-2 TMR decision (which was formed in the backdrop of a decade of cheap money) to reflect the current economic and investment environment.

7.2.6 Then, we provide updated evidence from TMR surveys, some of which Ofgem relied on in RIIO-2. We reflect on how this evidence has evolved since Ofgem reviewed it in 2020, and what it could mean for the CAPM-TMR range.

7.2.7 In applying these TMR cross-checks, we have paid particular attention to balancing Ofgem's stated principle of looking 'through the cycle' in setting the CoE, but at the same time set a TMR which is 'stable but not fixed', And that supports an investable CoE in RIIO-3.[60]

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59 We note that in our TMR Glider report, we had checked the Glider calibration against past regulatory decisions. To be clear, past regulatory decisions have no bearing on how we have defined the relationship between the required forward-looking TMR and gilt yields. We have estimated this relationship independently, but sought to check the resulting Glider against past regulatory decisions as a point of discussion in response to the UKRN Guidance's suggestion that TMR decisions can be set in a way which is "stable but not fixed".

60 We note the UKRN Guidance does not recommend a through the cycle approach e.g. the Guidance states that "This approach does not imply that regulators should simply pick the same fixed value for the TMR in each decision for all time". See for example UKRN (2023) UKRN guidance for regulators on the methodology for setting the cost of capital, p 19.

7.3 DGM, TMR Glider, and the long-term historical average

The Dividend Growth Model (DGM) as a cross-check

7.3.1 We consider that the Dividend Growth Model (DGM) provides a useful analytical framework for assessing TMR as it reflects current market conditions, through prevailing stock prices and expectations for dividend growth.

7.3.2 The DGM states that the current share price must be equal to the present value of future dividends received. Using this relationship, we are able to derive the market TMR, where we consider the prices of the market index as well as the average dividend expectations of the market index at any given point in time.[61]

7.3.3 We understand the common concerns regarding using DGM outputs for setting the TMR, including the reliance on long-run dividend growth assumptions and volatility of DGM-based TMR estimates. However, there are methods that can be deployed to overcome these concerns, such as using long-term historic ex post returns to calibrate the growth assumption such that the bias of the DGM estimate is removed. [62]

7.3.4 We consider that DGM information when used in partnership with other evidence can provide valuable market information, particularly in a world where regulators have adopted a policy where TMR is stable but not fixed. Reflecting market information such as this when cross-checking TMR can help operationalise this policy in a way that supports RIIO-3 investability.

The TMR Glider as a cross-check

7.3.5 At SSMC, in a report prepared for National Grid,[63] we set out to develop a framework to operationalise the UKRN's Guidance of setting a stable TMR by estimating a (linear) relationship between the market-implied required TMR and

61 See Annex A of our TMR Glider report

62 One challenge posed against using DGM estimates for setting a regulatory TMR is that long-term growth rate assumptions can cause DGM outputs can be biased. However, the DGM model can be 'calibrated' such that the historical DGM outputs complies with the long-run average outturn TMR, by assuming a long-term growth rate which would deliver this outcome. Such a calibration would reduce the influence of long-term growth assumptions sourced externally, which is traditionally how DGM-based TMR estimates are generated. But, such a calibration would maintain the informational advantage of using the DGM, in that the outputs would reflect current expectations based on contemporaneous share prices and expectations of short-term dividend growth. In other words, it would still inform on current expectations in the context of the longer business cycle while moderating volatility in DGM outputs. If such a calibration is performed, one could consider using those calibrated outputs directly or using these as a robustness check to generic DGM outputs.

63 Frontier Economics (2024) The relationship between total market return and gilt yields, prepared for National Grid Electricity Transmission.

gilt yields: the TMR Glider.[64] The development of the TMR Glider involved the following steps:

- Estimate monthly TMR using a two stage DGM model.
- Estimate a linear relationship between DGM estimates of TMR and gilt yields.
- Use the TMR Glider to cross-check Ofgem's proposed TMR range given the marked change in interest rate environment since RIIO-2.

7.3.6 We considered that the TMR Glider might serve as a useful guide or cross-check for regulators in understanding how to embody the UKRN 'stable but not fixed' guidance into their decision making.

7.3.7 We note that in its SSMD, Ofgem has not explicitly adopted the TMR Glider as a TMR cross-check. Ofgem stated that it still intends to adopt a 'through the cycle' approach in making our TMR decisions. We however continue to take the view that the TMR Glider should be considered in the round in setting the range for RIIO-3.

7.3.8 Specifically, we consider that DGM outputs can be used in partnership with the **long-term historical average TMR** and **TMR Glider** estimates as a balanced set of evidence to be considered alongside Ofgem's survey data to ensure the CAPM-TMR is set at an appropriate level.

7.3.9 The **long-term historical average TMR** specifically refers to the CPI/CPIH-real, 124-year arithmetic average typically considered by regulators. This figure is 6.97% in CPI/CPIH-real terms.[65] Using a long-term CPI/CPIH expectation of 2%, this equates to approximately 9.11% in nominal terms. We consider this a relevant benchmark of a TMR which is closer to a 'through the cycle' TMR.

7.3.10 At SSMC stage, we noted UKRN Guidance on setting TMR on a 'stable but not fixed' basis[66], where UKRN have suggested that such an approach does not imply that regulators, "pick the same fixed value for the TMR decision for all time, but that the TMR would be relatively less variable than the underlying RFR." We were also cognisant that the period of very low interest rates has reversed. By this same logic, TMR estimates should now increase.

64 The TMR Glider developed at that stage was intended as a cross-check.

65 Ofgem (2024) RIIO-3 Sector Specific Methodology Decision – Finance Annex, Figure 4

66 UKRN (2023) UKRN guidance for regulators on the methodology for setting the cost of capital, p 19.

Updated evidence of the TMR Glider and the DGM TMR

7.3.11 In this section, we show updated evidence from the TMR Glider and DGM modelling, and demonstrate how the evidence can be used to establish a TMR range consistent with stated policy objectives.

7.3.12 We have updated our analysis shown in our original TMR Glider report submitted in response to the SSMC, in line with the latest data available from Bloomberg.[67] As a result of this update, our latest TMR Glider equation is:

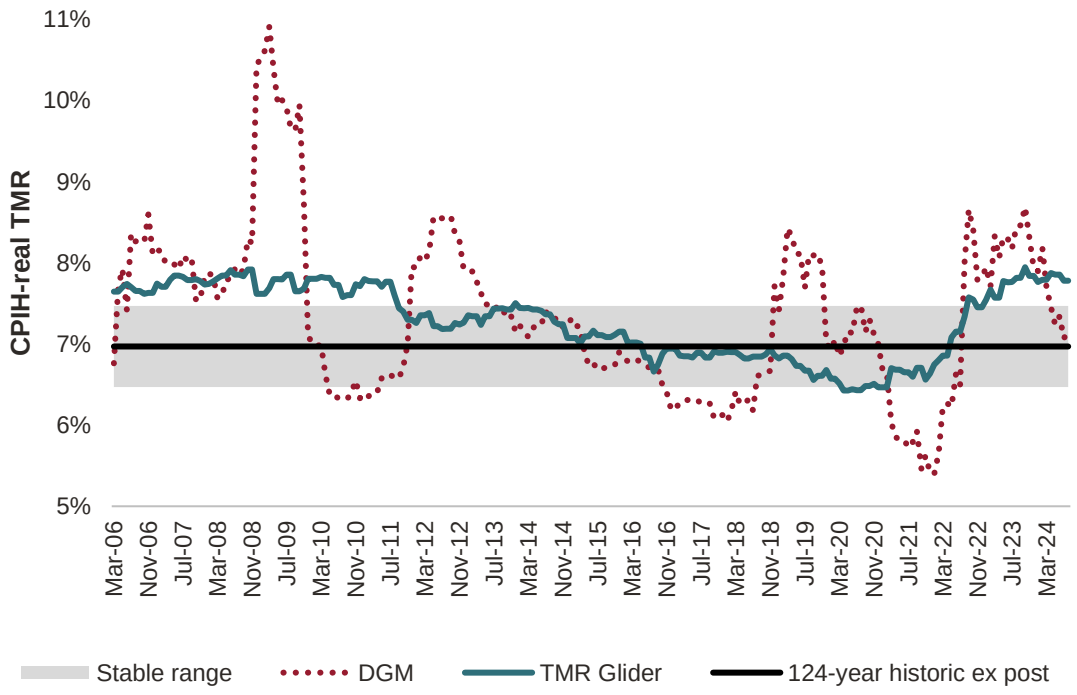
$$Nominal\ TMR = 8.34\% + 0.353\ x\ 20 - year\ nominal\ gilt\ yield$$

7.3.13 The updated set of evidence is shown in the figure below which covers:

- our two-stage DGM modelling, as shown in our TMR Glider report but updated for recently available data (dotted red line).
- The chart also shows historical values from the TMR Glider, based on prevailing gilt yields (solid teal line).
- The figure also shows the 124-year arithmetic average (6.97% CPIH-real and 9.11% nominal) as a benchmark of the long-term historical average (solid black line).
- Finally, the shaded grey area shows what we have termed a stable range, which we will explain in further detail in the rest of this section.

67 Some of the historic dividend projection data used in our two-stage DGM model has been refreshed by Bloomberg in the intervening time, our updated results reflect the latest data available from Bloomberg and show notable differences from our previous results in our original report (in relation to the Glider slope and intercept).

Figure 10 DGM-based TMR cross-check evidence and the 124-year arithmetic average TMR (CPIH-real)



Source: Frontier analysis, Ofgem
Note: CPIH-real figures have been derived using an inflation assumption of 2%.

7.3.14 We observe that over the last 24 months, the DGM and TMR Glider values sit above the long-term average of 6.97% CPIH-real. This indicates that current expectations of TMR lie above long-term average values. This is in line with the survey evidence Ofgem has hitherto relied on, which has increased by c. 2% or more since Ofgem reviewed the evidence in RIIO-2 (please see Section 8 for updated survey evidence).

7.3.15 Further, we observe that since 2006, both the TMR Glider and the DGM estimates fluctuate around the long-term historical average of 6.97% CPIH-real, the average of the DGM and Glider series being 7.4% and 7.3% CPIH-real, respectively.

7.3.16 The DGM estimates are more volatile, but **the width of the interquartile range of the Glider estimates is around 1%**.[68]

[68] The interquartile range of the Glider estimates are 9.0% - 9.9% nominal when we consider data from the beginning of 2006 to August 2024. This equates to approximately 6.9% - 7.7% CPIH-real, when we consider a 2% inflation assumption and the Fisher equation to convert to real figures.

7.3.17 In the next section, we outline how we can rely on the evidence set out above to determine a TMR range which meets Ofgem's objective to look 'through the cycle', but at the same time in line with the UKRN Guidance of setting a TMR which is 'stable but not fixed'.

7.4 Utilising the long-run historical average and DGM evidence as a cross-check to set a stable but not fixed TMR

7.4.1 As set out previously, this new cross-check evidence can be utilised to systematically set TMR in a way which meets regulatory objectives.

- **The central point** of this range is defined by the long-run, 124-year historical average, which **is approximately 7.0% CPIH-real**.[69]
- As set out above, the TMR Glider provides a framework for a TMR which moves with gilt yields, although not fully one-to-one. **We noted the width of the Glider interquartile range is c. 1%**, and therefore this could be interpreted a reasonable range of variation of a stable TMR.[70]
- Taking all of the evidence together, we consider it is reasonable to conclude that a **long-run unconditional, stable range of 6.5% - 7.5% CPIH-real** (unconditional on prevailing capital markets), anchored around the long-term average of 7.0% CPIH-real, could be an approach to setting the TMR which looks 'through the cycle', but is sufficiently flexible to allow it to respond to changes in the macroeconomic environment in a stable and predictable way.

7.4.2 Then, a question remains of whether a narrower TMR range within the stable range can be chosen for a given price control.

7.4.3 As shown in Figure 10, prevailing market conditions in the past two years would strongly suggest a **RIIO-3 TMR range** of **7.0% - 7.5%** and we recommend that the point estimate should be towards the top of that range.

- The Glider and the DGM values at any particular point in time could be used to gauge capital market conditions, and a point estimate within the unconditional range of 6.5% - 7.5% CPIH-real can be selected.
- Figure 10 shows the market TMR represented by the DGM has been above the stable range for a significant portion of the last two years. The Glider, which informs on a TMR that accounts for market conditions, has also

69 To be precise, this figure is 6.97% CPIH-real but we round this to 7% for ease of discussion.

70 We note that the TMR Glider predictions appear to be fairly symmetrical in that both the median and average both lie around 7.3% CPIH-real.

remained above the stable range. The two TMR cross-check reference points are in agreement.[71]

- In line with the principle of setting a TMR which is 'stable but not fixed', it would be reasonable for Ofgem to select a CAPM-TMR towards the top of the stable range, given market expectations and prevailing gilt yields. This would produce a CoE allowance which mitigates investability risks.

7.4.4 This proposed approach to applying the TMR cross-checks allows Ofgem to meet its objectives, as the point estimate of the TMR moves in a relatively tight range around the long-term historical average. Most importantly, this approach would better enable Ofgem to have regard to the investability objectives. We discuss this in Section 9 where we review the entire TMR evidence base as a whole.

71 Here, we have observed that both the DGM and the Glider estimates are outside of this range. Given the stated policy objectives, we do not suggest the TMR range and point estimate chosen for the CAPM needs to sit outside the stable range unless there is a very strong reason to do so e.g. in the face of significant challenges to investability.

8 TMR survey evidence

8.1 Context

8.1.1 At RIIO-2, Ofgem reviewed TMR forecasts from various financial institutions. In our view, these TMR forecasts can be characterised as survey evidence, given they are a collection of investors' revealed expectations on their forward-looking required equity market return.

8.1.2 Since our Investability report, we have reflected on the characteristics of survey evidence, and we consider it is more appropriately deployed as a TMR cross-check, rather than an overall CoE cross-check. Using the TMR survey evidence in this way removes the need to make assumptions on the risk-free rate and beta considered by survey respondents, which enhances the robustness of the cross-check.

8.1.3 It is important to note that survey evidence represents a 'reality check' of actual investors' expectations of TMR; however, expectations can contain biases, which we cannot observe or directly address. Therefore, we consider that survey evidence is most reliably used when observed over time, to determine trends in the required market return expected by investors in comparison to the previous regulatory settlement. Given the presence of unobserved biases, we do not think it is appropriate to directly use the current value of survey TMR to inform the TMR for the CAPM-CoE. Nevertheless we agree with Ofgem that TMR surveys provide useful information as a cross-check.

8.1.4 Given that survey evidence is most useful for ascertaining trends, we consider it is helpful if such evidence is reported on a consistent basis over time. This would be the case for the Fernandez TMR survey, which we have encouraged Ofgem to consider in prior submissions.

8.1.5 The Fernandez survey evidence is similar in nature to investment managers' TMR, but is drawn from a broader set of respondents including practitioners and academics. Not only that, the Fernandez survey has been compiled over a longer period of time and on a consistent basis, which may not be the case for all investment managers' TMR forecasts. Given the nature of survey evidence we think the addition of the Fernandez survey to this evidence base would enhance the quality of the TMR survey evidence base overall.

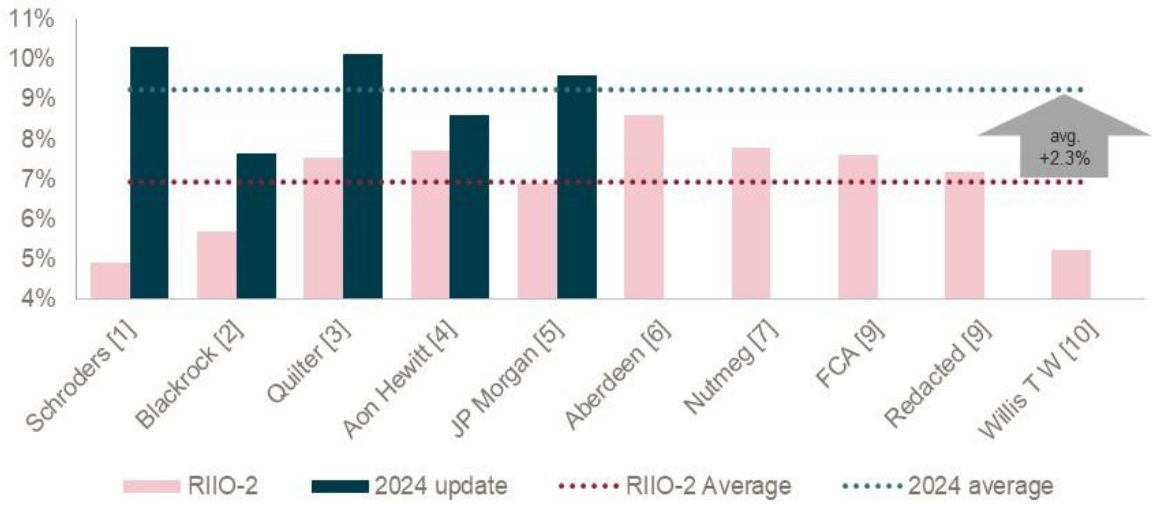
8.1.6 In the sections that follow, we provide updated data from both TMR surveys, and reflect on what this evidence indicates for the RIIO-3 TMR decision.

8.2 Investment managers' TMR forecasts

8.2.1 At RIIO-2 Ofgem took a simple average of TMR forecasts from various financial institutions to derive a TMR cross-check estimate of 7.10% nominal (5.0% CPIH-real).[72] In this section, we present updated evidence since the RIIO-2 Final Determinations.

8.2.2 We have collected updated data on TMR forecasts for the discount rates for 5 institutions out of the sample that Ofgem considered at RIIO-2.[73] The table below compares the TMR estimates presented by Ofgem in its draft determinations in July 2020 against the latest TMR forecasts.[74]

Figure 11 Change in investment manager TMR forecasts since 2020 (nominal)



Source: *Published forecasts of each author, Ofgem's RIIO-2 Draft Determinations Finance Annex*

Note: *Quilter is formerly known as Old Mutual. The values we show are in arithmetic averages, adjusted according to the approach Ofgem set out in RIIO-2. Consistent with Ofgem's previous analysis, we also show updated figures for Vanguard. However, we have excluded this from the overall average, because we understand the Vanguard portfolio contains fixed income instruments, which was why Ofgem did not fully consider Vanguard in its cross-check previously. Please see RIIO-2 SSMD, Finance Annex, paragraph 3.92.*

8.2.3 The figure above shows that:

72 Ofgem (2020), RIIO-2 Draft Determinations - Finance Annex, Table 24.

73 Of the remaining four authors that Ofgem considered at RIIO-T2, we have not found updated forecasts for three authors (Nutmeg, the FCA and Willis Towers Watson). The fourth author is listed as "redacted author" in Ofgem's draft determination and so we are unable to identify the relevant institution to provide an updated forecast.

74 These forecasts include a 1% uplift from geometric average to arithmetic average to put them on a comparable basis to Ofgem's TMR forecasts, which also include the 1% uplift (as discussed in RIIO-T2/GD2 SSMD (May 2019)).

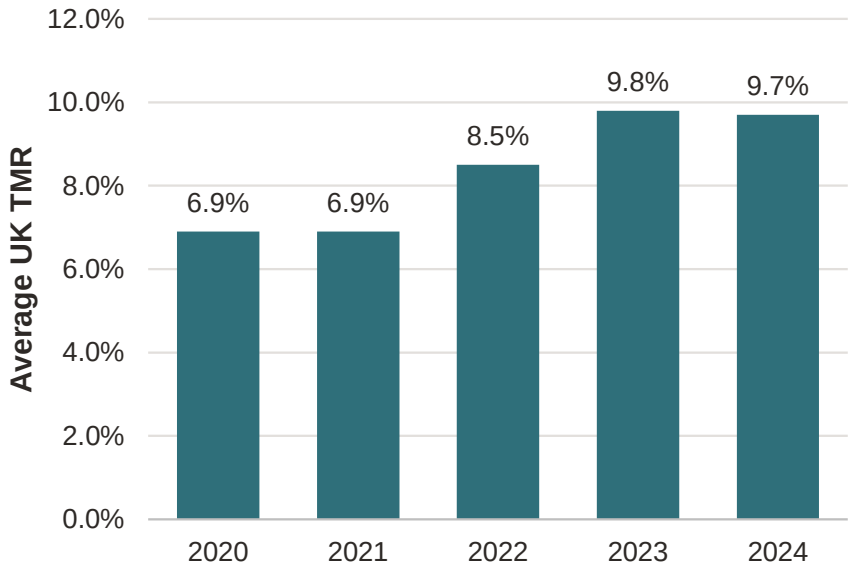
- The average of the forecasts Ofgem considers has increased from 6.9% in July 2020 to 9.3% in September 2024 (i.e. an increase of 2.3% in nominal terms).[75]
- All available forecasts have increased between 2020 and 2024 – some substantially. Across these 5 forecasts, the TMR has increased by 0.9% at a minimum and 5.4% at a maximum in nominal terms.

8.2.4 Overall, expectations of **market returns have increased significantly (about 2% on average in nominal terms)** since Ofgem reviewed similar evidence in RIIO-2.

8.3 Fernandez TMR survey

8.3.1 To supplement the Ofgem's investment managers' TMR, we consider the results from the annual survey of risk-free rates and market risk premium (MRP) conducted by Fernandez *et al*. The survey asks academics, analysts and managers of companies across many countries about the risk-free rate and MRP used 'to calculate the required return to equity in different countries'.[76] We provide updated evidence in the figure below.

Figure 12 Average UK TMR estimates as per Fernandez et al. (nominal)



Source: Fernandez et al. (2024), Survey: Market Risk Premium and Risk-Free Rate used for 96 countries in 2024

75 Figures do not sum due to rounding.

76 Fernandez, Pablo and García de la Garza, Diego and Fernández Acín, Javier (2023), Survey: Market Risk Premium and Risk-Free Rate used for 80 countries in 2023 , p. 2. The (2024) edition has outputs for 96 countries.

8.3.2 The figure below shows the average TMR estimates for the UK derived from the survey results. The evidence from the Fernandez survey points to a significant increase in the TMR between 2020 and 2023 **– an increase of c. 3 percentage points from 6.9% in 2020 to 9.7% in 2024 in nominal terms**. The figure between 2023 and 2024 for the UK was stable, only varying by 0.1 percentage points.

8.4 Overall findings from TMR survey evidence

8.4.1 In summary the TMR survey data from both investment managers and the Fernandez survey has **increased by at least two percentage points** in nominal terms since Ofgem's RIIO-2 Final Determinations.

8.4.2 Taken together, all the available evidence points to a significant increase in market expectations of TMR since RIIO-2. In our view, Ofgem must consider this evidence carefully and attach appropriate weight to it when setting its TMR range within the CAPM for RIIO-3.

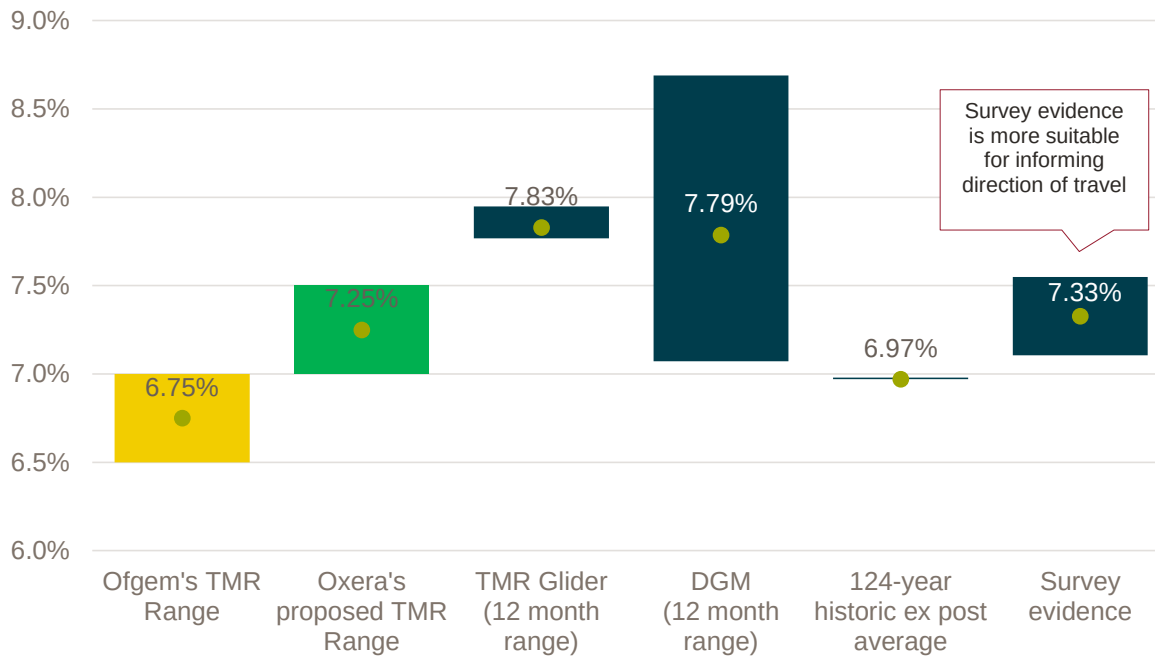
8.4.3 In addition, we found that the DGM-based cross-checks are in agreement with the survey evidence discussed here.

9 Review of TMR cross-check evidence

9.1.1 The figure below summarises Ofgem's TMR range against the full suite of TMR cross-check evidence.

9.1.2 We note the midpoint of Ofgem's TMR range sits below the long-term historical average of 6.97% CPIH-real; in fact, this is the top end of Ofgem's range. This is at odds with the TMR cross-checks presented in the above sections which shows that a 'stable' and market-implied (DGM) TMR have been fluctuating around the long-term historical average. In fact, all cross-check evidence suggests that the market required rate is currently significantly above the long run average.

Figure 13 TMR estimates and cross-checks (CPIH-real)



Source: *Ofgem, Frontier analysis, Oxera*

Note: *TMR Glider range represents the observed range over the last 12 months, which is 7.77% - 7.95%, with an average of 7.83%. All figures presented to 2 d.p.*
The DGM range represents the observed range over the last 12 months which is 7.07% - 8.69%, with an average of 7.79%. All figures presented to 2 d.p.
We derive CPIH-real figures using the Fisher equation and a CPIH assumption of 2%.

9.1.3 As discussed in Section 2, Ofgem's CoE point estimate sits below the lower bound of the hybrid bond cross-check; setting the CoE at this level could result in investability risks in RIIO-3. The TMR assumption included in Ofgem's Step 1 CoE is low when viewed against the TMR cross-check evidence as shown in the figure above.

9.1.4 The cross-check evidence therefore indicates the TMR is insufficient, which could explain why Ofgem's proposed CoE is too low when compared against an investable value implied by the hybrid bond cross-check.

9.1.5 More specifically, we find that Ofgem's TMR range in the SSMD is inconsistent with current market evidence, thereby introducing investability risks. This is clearly shown by our proposed TMR cross-checks.

9.1.6 We also found that the 25bps increase in the TMR range proposed in SSMD (when compared to RIIO-2) is inconsistent with the scale of change demonstrated by Ofgem's own TMR cross-checks, which imply that investor expectations of TMR have risen significantly since RIIO-2 (by at least 2 percentage points). In contrast, Ofgem's proposed TMR for RIIO-3 has moved only a quarter of a percentage point against its RIIO-2 decision. The evidence suggests that the TMR range for RIIO-3 should be higher.

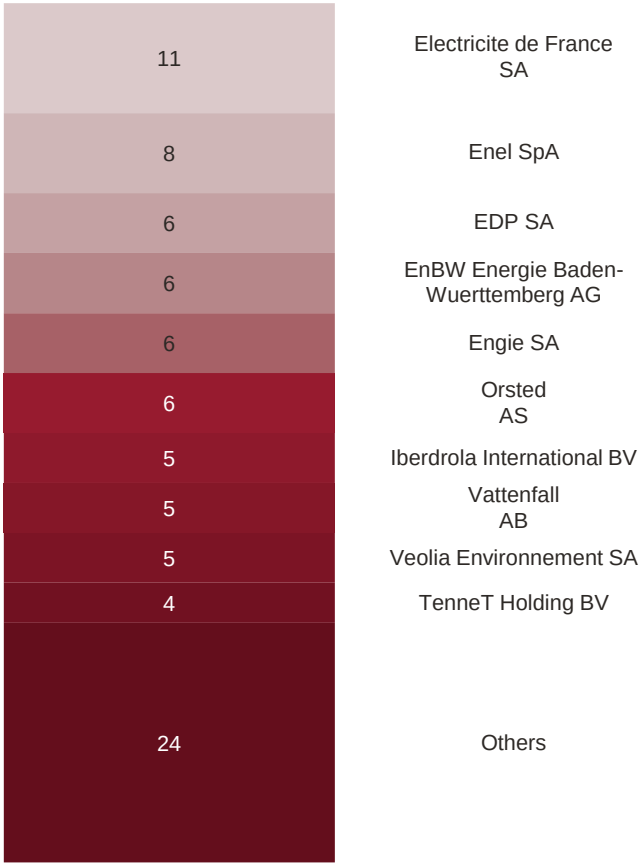
9.1.7 Taken all the evidence presented in this section, we conclude that a **long-run unconditional TMR range of 6.5% - 7.5% CPIH-real** would be appropriate as a stable but not fixed TMR range. However, the prevailing market conditions in the past two years would strongly suggest a **RIIO-3 TMR range** of **7.0% - 7.5%** and we recommend that the point estimate should be towards the top of that range. This is consistent with an investable CoE set out in Oxera's report.[77]

[77] Oxera (2024) 'RIIO-3 cost of equity—CAPM parameters', Prepared for Energy Networks Association

Annex A Hybrid bond sample information

A.1.1 In Section 2 we set out the process for obtaining hybrid bond data from Bloomberg. The issuers of the initial long list of 86 bonds are summarised in Figure 14 below. As shown there are a large number of energy companies who issue hybrid bonds. Some of the largest groups have several hybrid bonds outstanding.[78]

Figure 14 Hybrid bond screening outputs



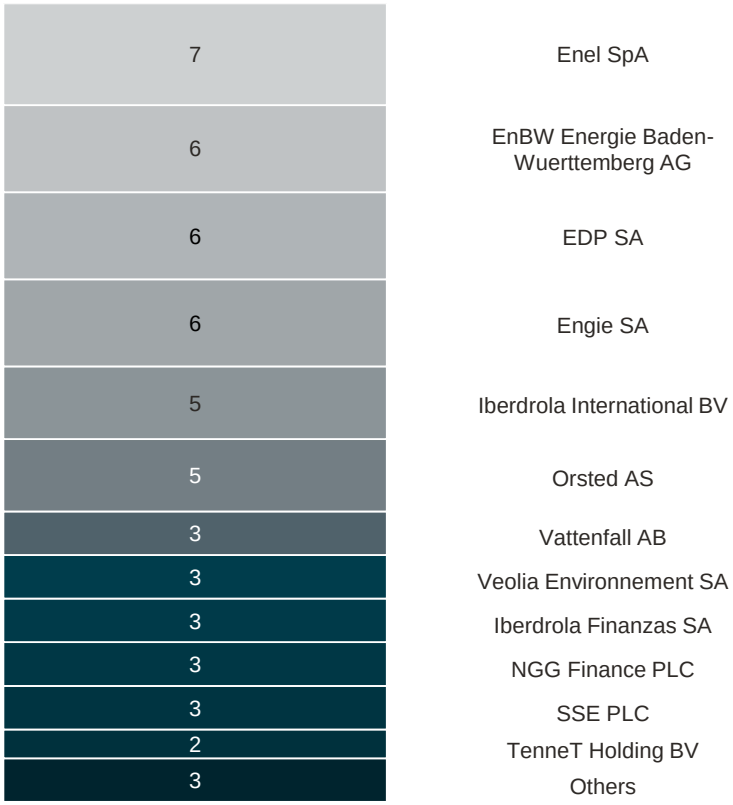
Source: *Frontier Economics, Bloomberg*
Note: *Figures reflect the number of bonds per company from the total list of 86 bonds*

A.1.2 The screening outputs included all six known hybrid bonds issued by NGG Finance Plc and SSE Plc from our Investability Report – providing confidence that the screening process is accurately capturing suitable comparators.

78 Others include companies with 3 or fewer hybrid instruments. These companies are: Iberdrola Finanzas SA, NGG Finance PLC, SSE PLC, Alliander NV, RWE AG, Terna - Rete Elettrica Nazionale, A2A SpA, Alpiq Holding AG, Centrica PLC, Elia Group SA/NV, Encavis Finance BV, Naturgy Finance Iberia SA, Redeia Corp SA, Stedin Holding NV, Union Fenosa Preferentes SA.

A.1.3 Following the filtering process applied (as discussed in Section 2), the short list of 55 bonds is summarised in Figure 15 below.[79]

Figure 15 Hybrid bond sample post-filtering



Source: Frontier Economics, Bloomberg

A.1.4 These spreads at issue (to iBoxx) for these bonds are used for the analysis in the report.

[79] These 55 are the bonds which passed all the filters and had the required data available.

Annex B Assumptions underlying MAR inference

B.1.1 In this Annex we show the baseline allowed cost of equity, expected outperformance and RAV growth values we have considered for inferring the CoE under the DGM model using the MARs in Section 4. We also describe the underlying assumptions for each scenario.

United Utilities

Table 5 Baseline allowed cost of equity

Scenario	Value	Underlying assumption
Base case High case Low case	4.80% + 0.05%	PR24 draft determination, including adjustment for BPI.[80]

Source: PR24 Draft Determinations

Table 6 Expected outperformance

Scenario	Value	Underlying assumption
Base case	1.57%	PR19 average reduced by half. (3.14% / 2)
High case	3.14%	PR19 average
Low case	0%	No room for outperformance.

Source: Full Year Results publications

Table 7 RAV growth

Scenario	Value	Underlying assumption
Base case	5.5%	1% reduction to company's business plans
High case	6.5%	Company's business plans

80 Strictly speaking we note the BPI adjustment can be classified as a kind of outperformance but we have included it here as it affects what Ofgem terms as the real return on equity, which is one of the primary assumptions required for MAR inference. The real return on equity is the sum of the baseline allowed CoE plus expected outperformance. See for example Table 16 in the ED2 Draft Determinations, Finance Annex.

Scenario	Value	Underlying assumption
Low case	4.5%	1% reduction to the base case

Source: PR24 Business plan submission presentation

Pennon

Table 8 Baseline allowed cost of equity

Scenario	Value	Underlying assumption
Base case	4.80% + 0.3%	PR24 draft determination including adjustment for BPI.
High case		
Low case		

Source: PR24 Draft Determinations

Table 9 Expected outperformance

Scenario	Value	Underlying assumption
Base case	2.01%	PR19 average reduced by half. (4.03% / 2)
High case	4.03%	PR19 average
Low case	0%	No room for outperformance.

Source: Full Year Results publications

Table 10 RAV growth

Scenario	Value	Underlying assumption
Base case	3.56%	1% reduction to company's business plans
High case	4.56%	Company's business plans
Low case	2.56%	1% reduction to the base case

Source: PR24 Business plan submission presentation

Severn Trent

Table 11 Baseline allowed cost of equity

Scenario	Value	Underlying assumption
Base case	4.80% + 0.3%	PR24 draft determination including adjustment for BPI.
High case		
Low case		

Source: PR24 Draft Determinations

Table 12 Expected outperformance

Scenario	Value	Underlying assumption
Base case	1.68%	PR19 average reduced by half. (3.35% / 2)
High case	3.35%	PR19 average
Low case	0%	No room for outperformance.

Source: Full Year Results publications

Table 13 RAV growth

Scenario	Value	Underlying assumption
Base case	4.55%	1% reduction to company's business plans
High case	5.55%	Company's business plans
Low case	3.55%	1% reduction to the base case

Source: PR24 Business plan submission presentation

Phoenix Gas

Table 14 Baseline allowed cost of equity

Scenario	Value	Underlying assumption
Base case	5.02%	Same as GD23
High case		
Low case		

Source: GD23 - Gas Distribution Price Control 2023-2028

Table 15 Expected outperformance

Scenario	Value	Underlying assumption
Base case	0%	We assume little room for cost-saving improvements that could drive outperformance
High case	0.5%	0.5% uplift to the base case
Low case	-0.5%	0.5% reduction to the base case

Source: Frontier Economics

Table 16 RAV growth

Scenario	Value	Underlying assumption
Base case	0%	Growth rates are projected to be negative, but DGM analysis breaks down with negative growth rates. Therefore we assume a 0% growth rate in all scenarios.
High case		
Low case		

Source: Phoenix Natural Gas Limited Business Plan

ENWL

Table 17 Baseline allowed cost of equity

Scenario	Value	Underlying assumption
Base case	5.46%	SSMD mid-point. We assume that bidding bids incorporated SSMD figures.
High case		
Low case		

Source: RIIO-3 Sector Specific Methodology Decision – Finance Annex

Table 18 Expected outperformance

Scenario	Value	Underlying assumption
Base case	2%	Operational outperformance in RIIO-ED2 + 1.1%. (0.9% + 1.1% due to factors such as synergies with existing Iberdrola assets)
High case	3%	1% uplift to the base case
Low case	1%	1% reduction to the base case. Similar level to operation outperformance in RIIO-ED2 (0.9%)

Source: Frontier Economics and ENWL Regulatory Financial Performance Reporting (RFPR) Commentary

Table 19 RAV growth

Scenario	Value	Underlying assumption
Base case	5%	RIIO-ED2 average growth (2024-2028) rounded down (5.8%).
High case	6%	1% uplift to the base case. Similar level to RIIO-ED2 average growth (5.8%).
Low case	4%	1% reduction to the base case.

Source: Frontier Economics and ED2 PCFM (July 2024)

Annex C MAR inference

C.1.1 In this annex, we provide detail on how we arrived at the CoE inference based on the parameters set out in Annex B. For this inference exercise, we have employed Ofgem's model from RIIO-ED2.[81]

C.1.2 In some cases, we applied an adjustment to account for differences in notional gearing. We set out our approach where relevant.

C.1.3 Our range of 4.90% - 12.33% considers all scenarios from all MARs set out in this annex.

C.2 Inference from traded MARs

C.2.1 In this section, we present the inference from traded MARs.

C.2.2 In the table below we present our inference results based on United Utilities' traded MAR.

[81] See for example: Ofgem (2022) RIIO-ED2 Draft Determinations – Finance Annex, Table 16

Table 20 MAR inference, United Utilities

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	4.85%	4.85%	4.85%
Expected outperformance	B	1.57%	0.00%	3.14%
Return on equity	C = A + B	6.42%	4.85%	7.99%
Projected RAV growth	D	5.50%	4.50%	6.50%
Dividend payout ratio	E = 1 - (D/C)	14.33%	7.24%	18.63%
Dividends paid	F = E x C	0.92%	0.35%	1.49%
MAR	G	1.10	1.10	1.10
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	1.23	1.23	1.23
Inferred CoE	J = (F/I) + C - F	6.25%	4.79%	7.71%
Inferred CoE at 60% gearing	(see note)	6.68%	5.03%	8.32%

Source: *Ofgem, Frontier*

Note: *All figures are presented in real terms. The MAR value is the average of the MAR estimated using the market value of debt and book value of debt.*
MAR values (G) are set out in Table 3 of this report.
In this case, we converted the Inferred CoE from 55% gearing to 60% gearing, for comparability with Ofgem's SSMD Step 1 CAPM. To do so, we first computed the allowed WACC at 55% gearing. For the regulated water networks, we assumed a CoD allowance of 2.84% in line with the PR24 draft determinations. For UU, this resulted in a WACC of 4.37% in the base case, for example (55% x 2.84% + 45% x 6.25%) = 4.37%.
Then, we derived the CoE assuming 60% gearing keeping the WACC constant, by taking (4.37% - 2.84% x 60%)/(1-60%) = 6.68%

C.2.3 In the table below we present our inference results based Pennon's traded MAR. We note that the High Case inferred CoE for Pennon forms the top end of our MAR cross-check range.

Table 21 MAR inference, Pennon

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.10%	5.10%	5.10%
Expected outperformance	B	2.01%	0.00%	4.03%
Return on equity	C = A + B	7.11%	5.10%	9.13%
Projected RAV growth	D	3.56%	2.56%	4.56%
Dividend payout ratio	E = 1 - (D/C)	49.91%	49.73%	50.01%
Dividends paid	F = E x C	3.55%	2.54%	4.57%
MAR	G	0.86	0.86	0.86
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	0.68	0.68	0.68
Inferred CoE	J = (F/I) + C - F	8.78%	6.29%	11.27%
Inferred CoE at 60% gearing	(see note under Table 20)	9.52%	6.72%	**12.33%**

Source: *Ofgem, Frontier*

Note: *All figures are presented in real terms. The MAR value is the average of the MAR estimated using the market value of debt and book value of debt.*
MAR values (G) are set out in Table 3 of this report
Our approach to deriving the inferred CoE at 60% gearing is set out in the note to Table 20

C.2.4 In the table below we present our inference results based Severn Trent traded MAR. We note that the Low Case inferred CoE for Severn Trent forms the bottom end of our MAR cross-check range.

Table 22 MAR inference, Severn Trent

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.10%	5.10%	5.10%
Expected outperformance	B	1.68%	0.00%	3.35%
Return on equity	C = A + B	6.78%	5.10%	8.45%
Projected RAV growth	D	4.55%	3.55%	5.55%
Dividend payout ratio	E = 1 - (D/C)	32.86%	30.41%	34.33%
Dividends paid	F = E x C	2.23%	1.55%	2.90%
MAR	G	1.17	1.17	1.17
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	1.38	1.38	1.38
Inferred CoE	J = (F/I) + C - F	6.16%	4.67%	7.65%
Inferred CoE at 60% gearing	(see note under Table 20)	6.58%	**4.90%**	8.25%

Source: *Ofgem, Frontier*

Note: *All figures are presented in real terms. The MAR value is the average of the MAR estimated using the market value of debt and book value of debt.*
MAR values (G) are set out in Table 3 of this report
Our approach to deriving the inferred CoE at 60% gearing is set out in the note to Table 20

C.3 Inference from transaction MARs

C.3.1 In this section, we present the inference results based on MARs from recent transactions.

C.3.2 In the table below we present our results based on MARs from the Phoenix transaction.

Table 23 MAR inference, Phoenix Gas

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.02%	5.02%	5.02%
Expected outperformance	B	0.00%	-0.50%	0.50%
Return on equity	C = A + B	5.02%	4.52%	5.52%
Projected RAV growth	D	0.00%	0.00%	0.00%
Dividend payout ratio	E = 1 - (D/C)	100%	100%	100%
Dividends paid	F = E x C	5.02%	4.52%	5.52%
MAR	G	0.95	0.95	0.95
Notional Gearing	H	55.00%	55.00%	55.00%
Equity Multiple	I = (G - H)/(1 - H)	0.88	0.88	0.88
Inferred CoE	J = (F/I) + C - F	5.70%	5.13%	6.27%
Inferred CoE at 60% gearing	(see note under Table 20)	6.20%	5.56%	6.83%

Source: *Ofgem, Frontier*

Note: *All figures are presented in real terms.*
Our approach to deriving the inferred CoE at 60% gearing is set out in the note to Table 20

C.3.3 In the table below we present our results based on MARs from the ENWL transaction.

Table 24 MAR inference, ENWL

	Calculations	Base Case	Low Case	High Case
Baseline allowed return on equity	A	5.46%	5.46%	5.46%
Expected outperformance	B	2.00%	1.00%	3.00%
Return on equity	C = A + B	7.46%	6.46%	8.46%
Projected RAV growth	D	5.00%	4.00%	6.00%
Dividend payout ratio	E = 1 - (D/C)	32.98%	38.08%	29.08%
Dividends paid	F = E x C	2.46%	2.46%	2.46%
MAR	G	1.64	1.64	1.64
Notional Gearing	H	60.00%	60.00%	60.00%
Equity Multiple	I = (G - H)/(1 - H)	2.60	2.60	2.60
Inferred CoE	J = (F/I) + C - F	5.95%	4.95%	6.95%

Source: *Ofgem, Frontier*

Note: *All figures are presented in real terms.*

C.3.4 We note that for ENW, there could be other factors (beyond the regulatory settlement) which would influence the MAR.

C.3.5 In paragraph 4.15, we explain how the dynamics of transactions could put upward pressure on transaction MAR. Specifically, bid prices will reflect investors' views of future cash flows and an uplift to ensure their bid is accepted over other offers, which results in this upward bias of transaction prices (and MARs). But there are many other fundamental factors in play too.

C.3.6 First, it is likely that synergies are a significant influence in ENW's case. ENW's distribution zone is geographically located in between SP Energy Network's (SPEN's) two distribution zones. As such, its acquisition by SPEN's owner Iberdrola results in the physical 'joining up' of SPEN's network. This would come with some clear synergies e.g. in terms of planning; SPEN can now develop a cohesive plan across the entirety of North West England and south Scotland.

C.3.7 Second, there are clear cost efficiencies in this case, especially when it comes to overheads, central costs, and indeed, bargaining power with suppliers, to name a few.

C.3.8 Third, we would anticipate the materialisation of operational benefits e.g. with respect to managing resilience. Post-acquisition, it is likely that SPEN will have an expanded set of options to manage interruptions, amongst other things.

C.3.9 This is not a comprehensive list, but simply a subset of many examples of how there are a multitude of factors outside the regulatory settlement which are likely influencing the ENW MAR.

C.4 Forming the range from the available MAR cross-check evidence

C.4.1 We have considered all scenarios from all available MAR evidence to form the range of 4.90% - 12.33%. The bottom end of this range is represented by Severn Trent's Low Case, and the top end of this range is represented by Pennon's High Case.