# Cost of Equity for RIIO-T3

A report for Scottish Power Transmission

14 November 2024

## CONFIDENTIALITY

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# 1.    Summary

Scottish Power Transmission (SPT) commissioned NERA Economic Consulting to review Ofgem's early view cost of capital a set out in its Sector Specific Methodology Decision (SSMD).  This report provides a review of Ofgem's proposed approach and our own estimate of the cost of capital for SPT over RIIO-3.

Table 1 summarises Ofgem's early view cost of equity compared to our estimate.  Ofgem's SSMD provides a cost of equity range of 4.57-6.35 per cent at 60 per cent gearing, below our estimated range of 6.49-7.06 per cent.  At Ofgem's assumed 55 per cent notional gearing for TOs, we estimate a cost of equity range of 6.08 to 6.58, and a mid-point of 6.33 per cent, as set out in Table 2.

**Table 1: Ofgem's SSMD Cost of Equity  Range of 4.57-6.35 per cent lies below NERA's Range of 6.49-7.06 per cent (@60 per cent gearing, as of 10 September 2024)**

|  | Ofgem SSMD | | NERA estimate | |  |
|---|---|---|---|---|---|
|  | **Low** | **High** | **Low** | **High** |  |
|  |  |  |  |  | **Comment** |
| [A] Risk-Free Rate | 1.18% | 1.18% | 2.44% | 2.44% | Ofgem based on ILG plus RPI-CPI wedge; NERA based on nominal gilt minus LT CPI forecast |
| [B] Asset Beta | 0.30 | 0.40 | 0.40 | 0.45 | Ofgem based on UK and European comparators; NERA based on European comparators, aimed up to reflect T3 totex risk |
| [C] Equity Beta | 0.64 | 0.89 | 0.89 | 1.01 | Based on debt beta of 0.075, observed gearing of 50% and notional gearing 60% |
| [D] TMR | 6.50% | 7.00% | 7.0% | 7.0% | Ofgem based on historic ex post and ex ante evidence; NERA based on historical AM of annual returns |
| **[E] Cost of Equity (@60 per cent gearing)** | **4.57%** | **6.35%** | **6.49%** | **7.06%** | [A] + [C] * ([D] - [A]) |

*Note: Asset Beta is calculated based on 0.075 debt beta, for both Ofgem SSMD and NERA estimates.  Source: Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, Table 13; NERA analysis.*

**Table 2: Ofgem's SSMD Cost of Equity Range of 4.24-5.82 per cent lies below NERA's Range of 6.08-6.58 per cent (@55 per cent gearing, as of 10 September 2024)**

| | Ofgem SSMD | | NERA estimate | | |
| --- | --- | --- | --- | --- | --- |
| | Low | High | Low | High | |
| | | | | | **Comment** |
| [A] Risk-Free Rate | 1.18% | 1.18% | 2.44% | 2.44% | Ofgem based on ILG plus RPI-CPI wedge; NERA based on nominal gilt minus LT CPI forecast |
| [B] Asset Beta | 0.30 | 0.40 | 0.40 | 0.45 | Ofgem based on UK and European comparators; NERA based on European comparators, aimed up to reflect T3 totex risk |
| [C] Equity Beta | 0.58 | 0.80 | 0.80 | 0.91 | Based on debt beta of 0.075, observed gearing of 50% and notional gearing 55% |
| [D] TMR | 6.50% | 7.00% | 7.0% | 7.0% | Ofgem based on historic ex post and ex ante evidence; NERA based on historical AM of annual returns |
| **[E] Cost of Equity (@55 per cent gearing)** | **4.24%** | **5.82%** | **6.08%** | **6.58%** | **[A] + [C] * ([D] - [A])** |

*Note: Asset Beta is calculated based on 0.075 debt beta, for both Ofgem SSMD and NERA estimates. Source: Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, Table 13; NERA analysis.*

**RFR: ILG yields do not provide a viable estimate for the RFR, given structural excess demand**

In its SSMD, Ofgem determines the risk-free rate based on solely on the yield of index-linked gilts (ILGs), as per its approach at RIIO-2. Ofgem acknowledges the existence of a convenience premium in shorter term ILG with money like features as the major driver, but states that there are no empirical estimates of the convenience yield for ILGs at the longer term horizon (10-20 year).

In this report, we show that ILG yields do not provide a viable estimate for the RFR, given structural excess demand. We have examined time-series for nominal gilts and ILG, and the implied 20-year breakeven inflation, i.e. the difference between the nominal and real yield. Our analysis shows that the level of breakeven inflation has remained at around 3 to 4 per cent since 2016, and is presently close to 3.5 per cent. We note that in 2020 the UK Statistics Authority (UKSA) decided to align the methodologies of RPI with those of CPIH as from early 2030 and, while the RPI measure will still be published beyond 2030, the growth rate of the index (i.e. RPI inflation) will be identical to growth in CPIH, i.e. where market expects CPI inflation of ca 2 per cent given Bank of England monetary target.

Given the prospective alignment of RPI and CPI from 2030, the 20-year breakeven inflation is implausibly high relative to market evidence on expected RPI inflation over the next 20 years of around 2 per cent.

**Figure 1.1: 20Y Breakeven inflation has remained around 3.5 per cent since 2023**
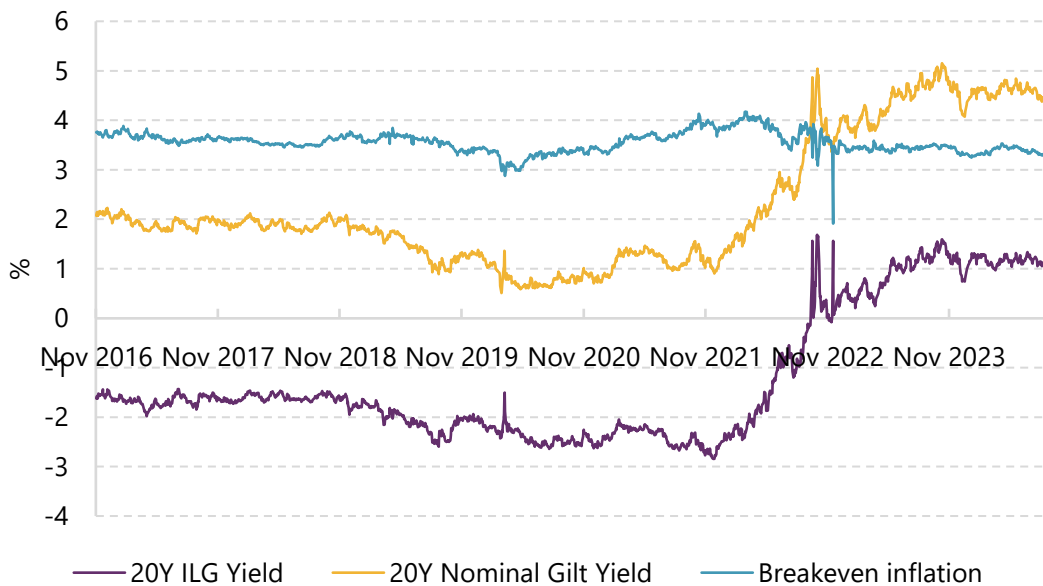


*Source: NERA analysis of Bank of England data.*

Further, we provide evidence that that the high breakeven inflation is explained by excess demand for gilts by pension funds who purchase ILG to match pension scheme liabilities "irrespective of price". A recent paper published by the Bank of England also notes that excess demand has led to a mis-pricing of inflation products.

In addition, we also show that ILG yields do not represent a rate at which all market participants can both lend and borrow because of the existence of a convenience premium. We provide evidence of a convenience premium of 40 bps, including evidence that the premium exists at the long end of the yield curve.

**RFR: The use of nominal gilt instruments provides the most viable approach to estimating the RFR**

We conclude ILG yields do not provide a viable estimate for the RFR, given structural excess demand and the existence of convenience premium which depresses yields below the true RFR. The evidence on breakeven inflation and excess demand constitutes new evidence on the mis-pricing of ILG, which constitutes a "good reason" for Ofgem to reconsider its approach at RIIO-3 and the UKRN Guidance.

One potential solution that addresses these concerns is the use of highly rated corporate debt indices. However, the use of corporate debt data to estimate the RFR may require adjustments for liquidity, credit and inflation risk premium. At RIIO-2 appeals, the CMA concluded that once we take into these factors there is little practical impact in including highly rated corporate debt indices in the estimation of the RFR.

The use of nominal gilt instruments provides the most viable approach to estimating the RFR, as it overcomes multiple risks inherent in corporate debt yields (e.g. default risk premium, illiquidity premium and term premium). In theory, nominal gilt yields should be further adjusted upwards for a convenience premium and potentially downwards for inflation risk; however empirical estimates

of the convenience premium of around 40bps are higher than CMA's estimate of the inflation risk premium of 15 bps, suggesting that nominal gilts may provide a conservative estimate of the RFR.

If nominal gilts are not used as the basis for the RFR, the next best solution is to incorporate a convenience premium of, say, 40 bps within Ofgem RPI ILG estimate; however, such an approach does not address our fundamental concern about depressed ILG yields.

**TMR: Ofgem makes errors in its calculation of historical ex post estimates**

Ofgem proposes to continue to estimate the TMR via an assessment of long-run historical returns, and to give weight to both historical ex post and historical ex ante estimates.  Ofgem estimates the ex post TMR to be 6.97 per cent, based on the arithmetic average of annual returns over the entire dataset.

For estimating the historical ex ante return, Ofgem draws on dividend growth model (DGM), e.g. as set out in the seminal Fama French 2002 paper, where the expected TMR is derived based on the historical dividend yield plus dividend growth.  The DGM approach (or "historical ex ante") allows us to assess whether the ex post historical return is high or low relative to the *expected* value, as the DGM is based on fundamental drivers of expected return and eliminates that element that is related to price-earnings expansion.  For the US market, Fama and French have shown that price-earnings expansion is material because of a (likely) decline in investors' discount rates, and this supported the use of a DGM approach that excludes this element of historical returns that is unlikely to persist.

However, we show that there is limited price-earnings expansion in the DMS data for the UK, and therefore the ex ante historical estimate should be practically identical to the ex post historical estimate save for the negligible P/E expansion of 0.03 per cent. We show that Ofgem derives a lower historical ex ante value of 6.5 per cent because it makes a number of errors. Correcting for these errors, we derive an historical ex ante value practically identical to the ex post.

Overall we conclude that the historical ex post provides a reasonable measure of the expected return.

**TMR:  We agree with Ofgem's use of simple one-year arithmetic mean as basis for ex post estimate**

For the historical ex post analysis, Ofgem's SSMD approach aligns with our view that the simple one-year arithmetic mean (AM) is the appropriate unbiased estimator for the purpose of estimating TMR in the regulatory context.  As explained by Professor Schaefer at recent CMA appeals, the regulator simply needs to provide an unbiased estimate of the expected annual return based on the simple arithmetic mean. The compounders and discounters will then make their own adjustments to this number according to whether they require unbiased estimates of future investment values, in which case the investors may reasonably rely on Blume, or unbiased estimates of the present value, in which case Cooper may apply.

Overall, we estimate a TMR of 7.0 per cent based on the annual AM. This compares to Ofgem's range of 6.5 to 7.0 per cent, but where Ofgem's lower bound is based on an historical ex ante approach which includes errors, and is not required in the absence of historical price-earnings expansion in the DMS data.

Our approach assumes that the TMR is constant over time and invariant to the RFR, reflecting regulatory practice over successive reviews and consistent with the UKRN guidance.  To the extent that the TMR varies positively with the RFR, our approach is likely to understate the TMR during a period of relatively higher interest rates, as per RIIO-3.

**Beta: Ofgem should rely on more robust European network evidence, which supports an asset beta range of 0.40-0.45 (including 0.075 debt beta)**

To estimate the asset beta, Ofgem considers data across 2, 5 and 10-year timeframes, but states that it anticipates relying most heavily on longer-term (10-year) timeframes when picking a point estimate. For the early view of the cost of equity, Ofgem concludes on a "wide" asset beta range of 0.30 - 0.40 which is principally based on UK listed water stocks (Severn Trent and United Utilities) as well as National Grid. However, Ofgem states its intention at SSMD to include relevant European utility comparators in addition to UK water companies and National Grid plc to estimate beta.

We show that NG's beta evidence should not be relied upon to inform beta over RIIO-3, given that its beta is affected by M&A activity which has reduced co-variance in market returns, but is not relevant on a forward looking basis. We also show that NG's UK regulated activity comprises less than 40 per cent of its group activity – with a substantive element comprising generally lower beta risk US regulated activities. Ofgem also should not rely on water sector beta evidence, which is of limited relevance to the UK gas and electricity sectors, not least because the water sector does not face the same risks under energy transition or the same level of capex: RCV, an established beta risk.

We conclude that Ofgem should determine beta based on a European T&D beta comparator set as the only pure-play energy networks operating under similar incentive based regulation.  Ofgem should extend its set of five European comparators to six to include Hera, and that Ofgem should consider a premium or uplift for additional beta risks UK networks expects to face over RIIO-3 related to Net Zero expenditure

Drawing on European comparators (i.e. excluding National Grid and UK water companies), and including Hera in the European comparator, we calculate a beta range of 0.38-0.44, compared to Ofgem's early view of 0.30 to 0.40.

Given the additional totex risk and the likely impact this will have on beta over RIIO-3, we consider the evidence broadly supports a range of 0.40 to 0.45, with a point estimate of 0.425.

## 2.    Introduction

In this report we set out our views on Ofgem's Sector Specific Methodology Decision (SSMD) guidance and early view on the cost of equity for RIIO-T3.  The report provides an overview of Ofgem's approach to each parameter in its SSMD and our alternative methodology and estimate correcting for errors in Ofgem's approach.

The report is structured as follows:

- Section 3 summarises Ofgem's decision to rely on indexed linked gilts (ILG) as its proxy for the risk-free rate (RFR). We provide evidence that ILG yields are depressed because of structural excess demand and Ofgem should instead rely on nominal gilts.

- Section 4 summarises Ofgem's decision to rely on historical ex post and ex ante estimates of the total market return (TMR). We demonstrate that Ofgem's estimate of the historical ex ante TMR is wrong, and once corrected, both approaches support a TMR at the top-end of Ofgem's range of 7 per cent.

- Section 5 summaries Ofgem's decision to rely on UK water and energy, and potentially European energy network comparators, to estimate beta. We provide evidence that European energy networks provide the most comparable measure of beta risk for UK energy networks over RIIO-3.

# 3.    Risk-Free Rate

## 3.1.    Ofgem SSMD on Risk-Free Rate

In its SSMD, Ofgem explains that it will determine the risk-free rate solely using the yield of index-linked gilts (ILGs), citing CMA's validation of this approach as appropriate.[1]  It specifies that the UKRN Guidance recommends using recent yields on ILGs, with a maturity matching the assumed investment horizon for the sector, to estimate the risk-free rate.[2]

Ofgem acknowledges the existence of convenience premium in shorter term with money like features as the major driver, but states that there are no empirical estimates of the convenience yield for ILGs at longer term horizon (10-20 year).[3]

Ofgem determines that there is no sound evidence suggesting the inclusion of other proxies and convenience yields adjustments, and maintains the use of a one-month average of 20-year ILG yields, updated annually, to estimate the risk-free rate.[4]  Ofgem chooses this averaging period to avoid "locking in" short-term volatility for the entire length of the control period. This is the same approach as for RIIO-T2.[5]

Ofgem recognises the need to estimate the difference between future CPIH and RPI inflation, referred to as the inflation "wedge", in order to convert ILG yields to CPIH-real terms.[6]  Ofgem estimates the average wedge based on CPI (as a proxy for CPIH) and RPI medium term forecasts from OBR.[7]

Ofgem uses ILG yield evidence combined with an RPI-CPIH wedge estimate to come to an early view risk-free rate of 1.18 per cent.[8]  Ofgem dismisses the idea of further adjustment arising from CPI-CPIH wedge and does not consider the inclusion of inflation swap data to be yielding material improvements in inflation wedge estimation, but acknowledges its merit as a cross-check tool.[9]

## 3.2.    Risk-Free Rate Estimate Based on SSMD Guidance

Below we estimate the current risk-free rate, and forecast the risk-free rate over RIIO-3, based on the approach set out in Ofgem's SSMD.  In particular, we construct an RPI-real risk-free rate based on the one-month average ILG yield and use this to derive a CPI-real risk-free rate based on RPI-CPI wedge evidence.

In its SSMD Ofgem estimated the risk-free rate based on the one-month average ILG yield as of March 2024. We update the risk-free rate based on ILG based on: i) one-month average ILG data

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1    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.42 and 3.44.

2    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.37.

3    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.46.

4    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para  3.52.

5    Ofgem (3 February 2021), RIIO-2 Final Determinations – Finance Annex, para 3.6 and 3.22.

6    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para  3.61.

7    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para  3.65.

8    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.81 and Table 3.

9    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para  3.63 and 3.70.

up to 10 September 2024 to replicate Ofgem's SSMD approach; and ii) forward ILG data as of October of every year in RIIO-3, in line with Ofgem's approach in RIIO-2, to demonstrate the expected indexed RFR allowance over RIIO-3.  We then convert this to CPI-real terms based on the latest CPI and RPI forecasts from OBR, with the latest available as of March 2024, and assume a zero RPI-CPI wedge from 2030 over the remaining tenor of the bond, consistent with Ofgem's approach in its early view cost of equity.

Based on this approach, we estimate a real risk-free rate of i) 1.24 per cent as of September 2024. and ii) 1.65 per cent over RIIO-3.

**Table 3.1: We Estimate a Real RFR of 1.24 per cent as of September 2024 under Ofgem's Approach**

| Parameter | Value |
|---|---|
| One-month average ILG yield (10 Sep 2024) | 1.14% |
| RPI-CPIH wedge | 0.11% |
| **Ofgem RFR (10 Sep 2024)** | **1.24%** |

*Source: NERA analysis.*

**Table 3.2: We Estimate a Real RFR of 1.65 per cent over RIIO-3 under Ofgem's Approach**

| | Oct-2023 | Oct-2024 | Oct-2025 | Oct-2026 | Oct-2027 | Oct-2028 | Oct-2029 | RIIO-3 avg. |
|---|---|---|---|---|---|---|---|---|
| Ofgem RFR | 2.72% | 1.40% | 1.48% | 1.56% | 1.65% | 1.74% | 1.81% | **1.65%** |

*Note: years shaded in green are used to calculate the RIIO-3 average.*
*Source: NERA analysis.*

## 3.3.    NERA Comments on SSMD Guidance

We have reviewed Ofgem's SSMD guidance for the risk-free rate, and have two key concerns with Ofgem's proposed approach:

- Ofgem is wrong to rely on ILG yields because of a structural excess demand which depresses yields; and,

- Ofgem's proposed approach does not recognise the convenience premium associated with sovereign debt yields.

### 3.3.1.  Breakeven Inflation and RPI-CPI forecasts

Ofgem states in the SSMD its intention to rely exclusively on ILG evidence.  Figure 3.1 provides time-series for both ILG and nominal yields over the period since 2016, and breakeven inflation over the 20-year tenor of the bonds, calculated as the difference between the real and nominal yields.

**Figure 3.1: 20Y Breakeven inflation has remained around 3.5 per cent since 2023**
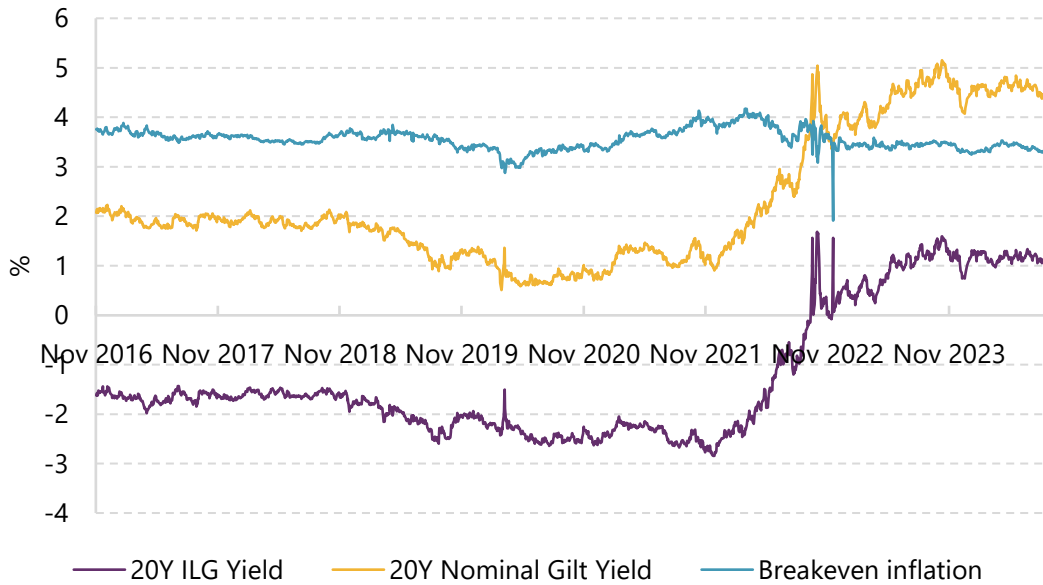


*Source: NERA analysis of Bank of England data.*

As can be seen in Figure 3.1 above, 20-year breakeven inflation has persistently remained between 3 and 4 per cent over the period since 2016, and at around 3.5 per cent over the past 2 years or so.

The level of breakeven inflation at 3.5 per cent is high relative to other market evidence on expected RPI inflation over the next 20 years. The UKSA has made a decision to align the methodologies of RPI with those of CPIH as from early 2030 and, while the RPI measure will still be published beyond 2030, the growth rate of the index (i.e. RPI inflation) will be identical to growth in CPIH.[10] Market evidence on RPI-CPI swap data shows that the market expects broad alignment of the two measures as from 2030, with a small positive RPI-CPI differential of around 20 bps.

However, we understand that the premium between the two indices beyond 2030 is likely to be explained by liquidity issues, namely one directional activity from liability driven investors (LDI) market participants rather than a market expectation of continued RPI-CPI divergence. [11]

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[10]   HM Treasury (11 March 2020), A Consultation on the Reform to Retail Prices Index Methodology, para 43-45.

[11]   NERA discussions with a clearing bank.

**Figure 3.2: 10-year ahead 5-year RPI-CPI difference, Jan 2020 – Sep 2024 (1-month average)**
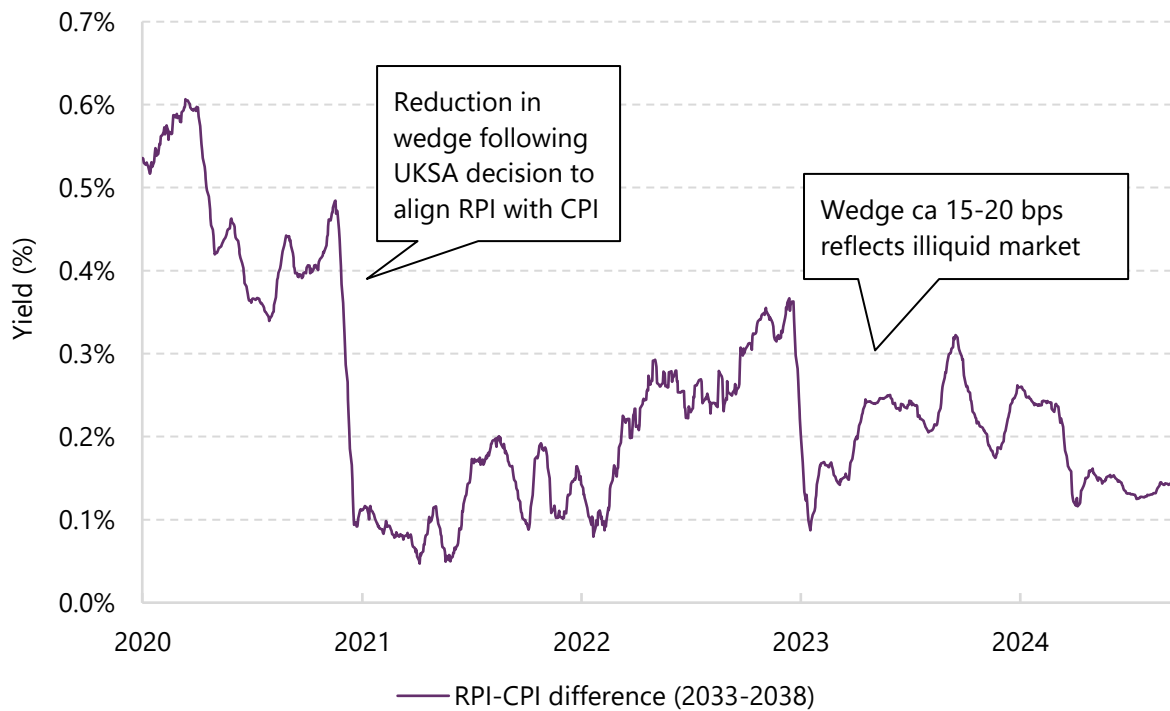


*Source: NERA analysis of RPI-CPI swap rate data.*

Table 3.3 sets out short-term inflation forecasts from HM Treasury and OBR. Combining these short-term RPI forecasts with the expected RPI of 2 per cent from 2030, aligned with CPIH monetary policy target, we estimate a market-based 20Y RPI of ca 2.2 per cent, as per Table 3.3 .

Overall, breakeven inflation at around 3.5 per cent is implausibly high compared to short-term survey evidence from HMT and OBR combined with the monetary policy target of 2 per cent.

**Table 3.3: Forecasts from HMT and OBR support 20-year RPI inflation of ca 2 per cent – far below 20Y BE of 3.5 per cent**

|  | 2025 | 2026 | 2027 | 2028 | 2030+ | Implied 20-year RPI |
|---|---|---|---|---|---|---|
| HMT (Aug 2024) | 2.7 | 2.8 | 3.3 | 3.4 | 2.0% | 2.2% |
| OBR (Mar 2024) | 2.0 | 2.5 | 3.0 | 2.9 | 2.0% | 2.1% |

*Note: As HM Treasury and OBR forecasts do not extend beyond 2028, we calculate the implied 20-year RPI by averaging 19 data points, omitting year 2029 and assuming 2 per cent RPI thereafter. Source: HM Treasury (August 2024), Forecasts for the UK economy: a comparison of independent forecasts, p.20; and Office for Budget Responsibility (March 2024), Economic and fiscal outlook.*

### 3.3.2.  ILG yields suppressed by structural excess demand

One reason for the persistently low ILG's relative to nominal bonds may be the very high demand for ILG's from insurance and pension funds, who frequently acquire ILGs "*irrespective of their*

*price*".[12]  This is because defined benefit (DB) pension schemes in particular commonly set out benefits linked in some way to inflation, meaning there is a strong desire from pension fund trustees to cover or hedge that exposure.[13]  This strong demand from UK DB pension schemes (which has an asset base of £1,800 billion) has led to a supply-demand imbalance for ILGs, resulting in negative real returns.

As an example of this demand-supply imbalance ILG yields have not moved to reflect the alignment of RPI and CPI by 2030 as expected, as we show in Figure 3.1, and as market observers have commented.  For example, a report from PwC comments:[14]

"*It's odd that the market has hardly reacted to the news that the RPI formula will be nearly 1% a year lower from 2030. Pension fund investors are still prepared to pay significant premiums for inflation protection via index-linked gilts, despite record price levels*".

A research paper published in 2023 by the Bank of England itself has also acknowledged the mis-pricing of ILG.[15]  The paper concludes that:

*   there is persistent inflation mispricing over the 2018–22 period, with nominal gilts on average 135 basis points more expensive than their synthetic counterparts constructed from inflation swaps and inflation-linked bonds;

*   liability-driven investors and pension funds (LDI-P) is a key driver of inflation mispricing – the sector's orderflows in inflation-linked bonds and (to lesser extent) nominal bonds and inflation swaps contribute significantly to day-to-day variations in mispricing;

*   the generally weak link between market-based measures of inflation expectations and survey-based measures is strengthened once clean market prices are adjusted for the effect of outsized LDI-P trading activity.

It follows from the Bank's findings, which are consistent with observations of other market participants as set out above, that the impact of outsized demand for ILGs from liability-driven investors is resulting in mispricing in ILG markets, making their yields a flawed basis for estimating the risk-free rate.

This new evidence on the mis-pricing of ILG was not considered at RIIO-2 (or not to such a degree), and therefore constitutes a "good reason", as Ofgem defines the term, to depart from UKRN Guidance and Ofgem's RIIO-2 approach.[16]

### 3.3.3.  Government bonds include convenience premium

Notwithstanding our concerns with the mis-pricing of UK ILG because of structural excess demand, we also have a conceptual concern with the sole reliance on government debt instruments given the existence of a convenience premium.

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[12]  Investors Chronicle (8 November 2023), When to buy index-linked bonds.

[13]  PwC (9 July 2021), Pension funds risk losing £200bn of returns from inflation strategies as index-linked gilts reach record high prices, PwC analysis shows.

[14]  PwC (9 July 2021), Pension funds risk losing £200bn of returns from inflation strategies as index-linked gilts reach record high prices, PwC analysis shows.

[15]  Bank of England (August 2023), Mispricing in inflation markets, pp.1-3.

[16]  Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 1.19.

Ofgem acknowledges the idea of the convenience premium (or "convenience yield") in the SSMD, but determines that there is no sound evidence suggesting the inclusion of a convenience yield adjustment to gilt yields.[17] Ofgem previously defined the convenience premium as the value that investors ascribe to instruments such as ILGs over and above their proximity to being "risk-free".[18] The "convenience premium" therefore introduces a gap between corporate and sovereign risk-free financing rates, which is a problem in the CAPM framework if government bond yields are used as the basis for the RFR, as the CAPM rests on the assumption that the RFR reflects a rate at which all market participants can borrow and lend.

The convenience premium arises due to the unique characteristics of sovereign bonds: empirical research shows that government bonds have special safety and liquidity characteristics compared to other securities, including i) greater perceived safety of government debt instruments, high liquidity and their ability to be used as collateral (both of which contribute to "moneyness" of government bonds).[19] As a result, government bond yields are pushed below the required rate of return for a zero-beta asset, i.e. below the rate of return that the risk-free rate is meant to capture in the CAPM framework.

Ofgem's proposed use of ILG understates the risk-free rate, as ILGs are likely a negatively biased estimate of the risk-free rate (even setting aside the issue of excess demand). To achieve an unbiased estimate of the RFR, proxies need to be found that are available to relevant market participants, which include non-government market participants who are unable to borrow at the government bond rate (such as corporate issuers).

At recent regulatory reviews, regulators and regulated companies have considered two principal ways to estimate a RFR relevant to all market participants: by adding a convenience premium to ILG, or alternatively, infer the RFR directly from highly-rated (i.e. AAA) corporate bond yields, as we discuss below. However, we conclude that the RFR should draw on nominal government bonds, as such an approach addresses our concerns with depressed ILG yields, and provides a sufficiently liquid benchmark.

### 3.3.4. Adding a convenience premium to ILG would not address issue of depressed ILG yields

A RFR that is relevant to both sovereign and corporate issuers can be achieved by adding an estimate of the convenience premium to the estimate of the RFR based on government bonds.[20]

We note that although UKRN recommendation is to use ILG as the basis for the RFR, in relation to the convenience premium, the UKRN Guidance does not propose a particular stance, but states that regulators should set out their views.[21] An adjustment to ILG is therefore consistent with the Guidance.

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[17]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para  3.52.

[18]   Ofgem (13 December 2023), Sector Specific Methodology Consultation – Finance Annex, para 3.28.

[19]   Jiang, Z. et al (6 October 2022), Bond Convenience Yields in the Eurozone Currency Union, p.3; Bonam, D. (2 March 2022), A convenient truth: The convenience yield and implications for fiscal policy, p.2.

[20]   See e.g. Van Binsbergen et al (August 2019), Risk-free interest rates.

[21]   Ofgem (13 December 2023), Sector Specific Methodology Consultation – Finance Annex, para 3.30, p. 28

Ofgem expresses concern regarding the lack of academic evidence on the size of the convenience premium for ILG at the 10 to 20 year investment horizon, as an obstacle to making such an adjustment.[22]  More recent academic evidence provides further evidence for convenience yield for UK gilts of around 40 bps, consistent with estimates by the authors for other markets and other studies, although this evidence also focusses on short tenors.[23]

While Ofgem has questioned the existence of the convenience premium on longer-dated government bonds (such as the 20-year ILGs it uses to estimate the RFR), there is academic evidence that long maturity convenience yields exist in other countries such as the US.[24]  Similarly, estimates of the convenience premium at shorter maturities indicate that the term structure of interest rates is relatively flat, i.e. that the convenience premium does not diminish at longer bond maturities.[25]

However, in the case of RPI ILG, we have concerns that yields are depressed, and adding a premium of (say) 40 bps does not address the fundamental concern with RPI ILG yields; rather we would need to consider a premium to nominal gilts net of other potential adjustments as we discuss below.

### 3.3.5.   Inferring RFR from highly rated corporate debt

As an alternative, as per the CMA PR19 approach and Utility Regulator at GD23, we can allow for a convenience premium by drawing directly on highly-rated corporate bond indices (as well as gilts) in setting the RFR.

We have reviewed two iBoxx non-gilt AAA indices for potential estimation of a risk-free rate and address the issue of a convenience premium – the iBoxx £ Non-Gilt AAA 10-15Y and the iBoxx £ Non-Gilt AAA 10+Y.  These are the same indices used by the CMA at PR19, and the same indices used by the Utility Regulator in Northern Ireland for its GD23 price control to estimate the risk-free

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[22]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.46.

[23]   Diamond, W. and Van Tassel, P. (February 2023), Risk-Free Rates and Convenience Yields Around the World.  Other papers estimating the size of the convenience premium also yield estimates ranging between 40-50bps.  Sources: Safety, liquidity, and the natural rate of interest; Del Negro et al., Brookings Papers on Economic Activity, April 2017, Figure 7, page 33.  The Aggregate Demand for Treasury Debt, Krishnamurthy and Vissing-Jorgensen, Journal of Political Economy, April 2012, page 4.  Risk-free interest rates, Van Binsbergen et al., NBER, August 2019, page 2

[24]   Del Negro et al (April 2017) Safety, liquidity, and the natural rate of interest; Brookings Papers on Economic Activity, Figure 7, page 267.  Krishnamurthy and Vissing-Jorgensen (April 2012), The Aggregate Demand for Treasury Debt, , Journal of Political Economy, p.234.

[25]   Van Binsbergen et al (August 2019), Risk-free interest rates, p.1.

rate.[26]  The CMA highlighted at RIIO-2 appeal the following concerns with the use of AAA corporate bond data including:[27]

* Practical problems with AAA corporate bond data, such as limited diversity within AAA indices and the potential inclusion of bonds with very difference characteristics;

* Challenges in identifying suitable specific AAA bonds and the complexity of any necessary adjustments;

* It observed that if long dated AAA bonds are removed, the gap between ILG yields and AAA index yields reduces significantly.

In the SSMD, Ofgem also re-iterates such concerns and Ofgem rejects the use of AAA rates debt, for example, given few observations and many of the bonds are very long-dated.[28]  Ofgem also states that corporate bond yields would have to be adjusted for liquidity and default premium, concluding that such adjustments could imply that the corporate bond yields lie below the nominal sovereign bond yield of equivalent tenor.[29]

## 3.4.    Estimating RFR based on nominal gilt yields

We conclude that the use of nominal gilts provides the best proxy for estimating the RFR.  As set out above, we do not consider that an adjustment to the ILG for the convenience premium addresses our fundamental concerns around depressed ILG yields from excess demand.  The approach also addresses Ofgem's concerns about reliance on AAA -rated corporate debt around too few relevant bonds, and the potential for adjustments for liquidity and default premium.

Figure 3.3 sets out 20 year nominal gilt yield as well as AAA corporate indices relied upon by the CMA at PR19.  As shown, nominal gilt yields have on average remained 15-30bps below AAA-rated corporate bond index yields, although the gap between the two has substantively narrowed over the most recent period.

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[26]    See CMA (17 March 2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, Final Report, para 9.241-9.243; Utility Regulator (October 2022), Gas Distribution Price Control 2023-2028 – Final Determinations, para 10.17.  Note, however, that UR only relies on gilt yields in its indexation mechanism for the risk free rate (Rate of return adjustment mechanism), as the regulator places the most weight on gilt yields in its risk-free rate estimate (50 per cent weight on gilt yields, 25 per cent weight on iBoxx yield data for each index).  See Utility Regulator (October 2022), Gas Distribution Price Control 2023-2028 – Final Determinations, para 10.45.

[27]    The CMA did also set out some support for the feasibility of relying on AAA bond and index data to estimate the risk-free rate, e.g. setting out that AAA bonds should not be disregarded simply because of the difficulty of carrying out necessary adjustments to yield data.

[28]    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.46.

[29]    Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.50

**Figure 3.3: iBoxx AAA Non-Gilt Yields and Nominal Gilt Yields, 2019-2024**
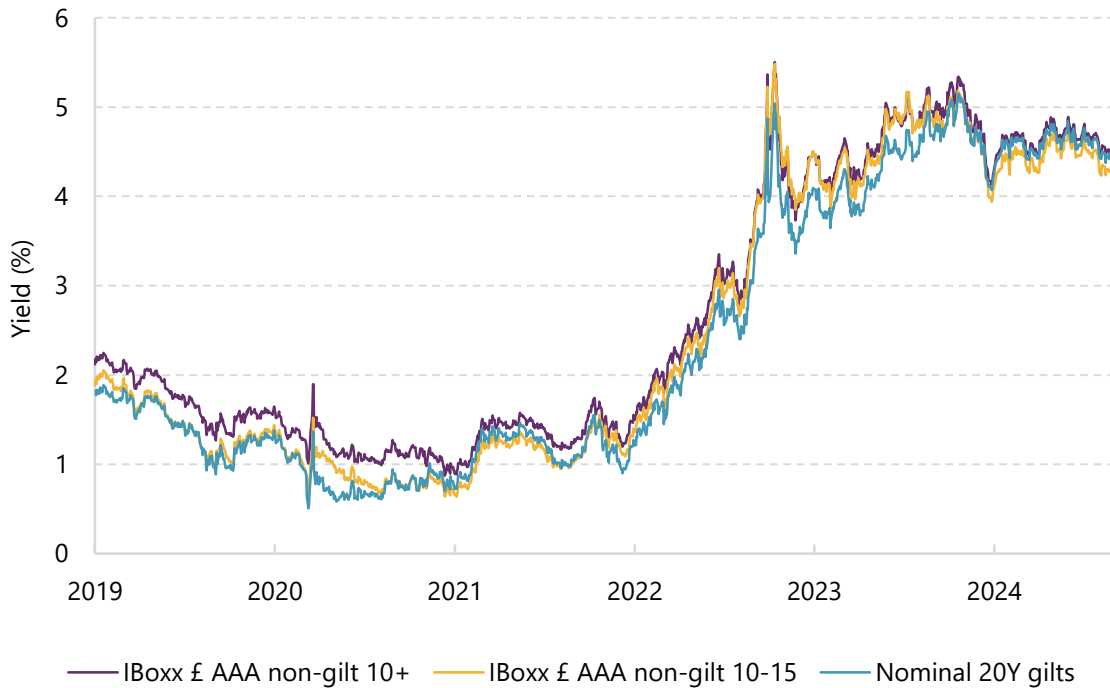


*Source: NERA analysis of FactSet and Bank of England data.*

Drawing on nominal gilt yields adjusted for long-term CPI forecasts, we estimate a risk-free rate of 2.44 per cent as of September 2024 (120 bps higher than our estimate based on Ofgem's approach), as set out in Table 3.4 below. As we set out in Section 3.3.1 and 3.3.2, this difference is a result of the structural excess demand for ILG yields which depressed yields, as demonstrated by the implausibly high implied breakeven inflation relative to market based inflation forecasts.

**Table 3.4: Ofgem's Risk-Free Rate Approach Yields a Lower RIIO-3 Estimate than using Nominal Gilts**

|  | Oct-2023 | Oct-2024 | Oct-2025 | Oct-2026 | Oct-2027 | Oct-2028 | Oct-2029 | RIIO-3 avg. |
|---|---|---|---|---|---|---|---|---|
| Ofgem | 2.72% | 1.40% | 1.48% | 1.56% | 1.65% | 1.74% | 1.81% | **1.65%** |
| Nominal gilt – CPI | 3.39% | 2.39% | 2.44% | 2.49% | 2.56% | 2.63% | 2.69% | **2.62%** |

*Note: all calculations are based on financial market data as of 10 September 2024.  Years shaded in green are used to calculate the RIIO-3 average.*
*Source: NERA analysis.*

**Table 3.5: Real Risk-Free Rate for RIIO-3 Based on Nominal Gilts**

| Component | Value |
|---|---|
| Nominal gilt yields (Sep 2024) | 4.45% |
| -      Long-term CPIH forecast | 1.96% |
| Nominal gilt yields (adjusted for CPIH) | 2.44% |
| CPI-real RFR based on Ofgem approach | 1.24% |
| **Difference to RFR based on Ofgem approach** | **1.20%** |

*Note: we deflate for long term CPIH forecasts using the Fisher equation.  All calculations are based on financial market data as of 10 September 2024.  Source: NERA analysis.*

## 3.4.1.  Adjusting for inflation risk and convenience premium

At RIIO-2, Ofgem rejected the use of nominal government debt instruments because of the existence of an inflation risk premium.[30]  An inflation risk premium is needed to compensate nominal gilt holders for unexpected inflation volatility.  At RIIO-2, Ofgem argued that the inflation risk premium added a further element of discretion if the estimation of the risk-free rate relied on nominal bonds, which would be avoided by instead relying on ILG yields.

The sign of this inflation risk premium depends on the correlation between inflation and real economic growth – if positive (i.e. inflation is pro-cyclical), nominal bonds act as "insurance", as a negative *growth* surprise is linked to a negative *inflation* surprise, and so nominal yields are lower relative to ILG yields (negative premium).  If this correlation is negative, then a negative growth surprise is linked to higher inflation - nominal bonds would underperform in such a scenario, resulting in higher nominal yields to compensate for this risk.  As set out in the CMA's Final Decision at RIIO-2, CMA concludes that the inflation risk premium was positive, and provided an estimate of 15bps.[31]

If we make such a downward adjustment for the inflation risk premium, then it is imperative to make an upward adjustment for the convenience premium, as set out in section 3.3.3 above.  We

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[30]   Ofgem (February 2021), RIIO-2 Final Determinations – Finance Annex (REVISED), para 3.12.

[31]   The estimate corresponded to the average over the period between 2005 and 2014.  CMA (28 October 2021), Final determination – Volume 2a: Joined Grounds: Cost of equity, para 5.140.

believe that the existence of the convenience premium (more than) offsets the need to adjust the nominal gilt yield downward for an inflation risk premium, thereby making nominal gilt yields a reasonable and indeed conservative estimate of the risk-free rate.

## 3.5.    Conclusions on RFR

ILG yields do not provide a viable estimate for the RFR, given structural excess demand and the existence of convenience premium which depresses yields below the true RFR.  This is new evidence on the mis-pricing of ILG, which constitutes a "good reason" for Ofgem to reconsider the UKRN Guidance.

One potential solution that addresses these concerns is the use of highly rated corporate debt indices.  However, the CMA at RIIO-2 agreed with Ofgem's concerns around the use of corporate debt data to estimate the RFR, including the need to adjust for liquidity, credit and inflation risk premium.  At RIIO-2 appeals, the CMA concluded that once we take into these factors there is little practical impact in including highly rated corporate debt indices in the estimation of the RFR.

The use of nominal gilt instruments provides the most viable approach to estimating the RFR, as it overcomes multiple risks inherent in corporate debt yields (e.g. default risk premium, illiquidity premium and term premium). In theory, nominal gilt yields should be further adjusted for an inflation risk premium and convenience premium; however empirical estimates of the convenience premium of around 40 bps are higher than CMA's estimate of the inflation risk premium of 15 bps, suggesting that nominal gilts may provide a conservative estimate of the true RFR.

However, if Ofgem were not to use nominal gilts to estimate the RFR, then we consider the next best solution is to incorporate a convenience premium of 40 bps within its RPI ILG RFR estimate. Albeit, as we have set out in section 3.3 above, we provide evidence that RPI ILG yields are depressed, and adding a convenience premium does not address the fundamental problem with RPI ILG.

# 4.   Total Market Return (TMR)

## 4.1.   Ofgem SSMD on Total Market Return

For RIIO-3, Ofgem proposes to continue to estimate the TMR rather than the ERP, and proposes to calculate the ERP as the residual, i.e. TMR – RFR.[32]

Ofgem proposes to continue to estimate the TMR via an assessment of long-run historical returns, and to give weight to both historical ex post and historical ex ante analysis.  Ofgem will deflate historical returns using a combination of the Consumption Expenditure Deflator (CED) (1900 - 1947), ONS's CPIH backcast (1950 - 1988) and ONS 'actual' CPIH datasets.[33]

Regarding the historical ex post analysis, Ofgem estimates the ex post TMR to be 6.97 per cent, based on the arithmetic average of annual returns over the entire dataset.[34]

As shown in Figure 4.1 below, Ofgem presents a range of TMR estimates based on different averaging techniques in the SSMD. However, Ofgem states that since it will estimate the TMR range using both ex post and ex ante approaches, it does not find significant value in determining an ex post range, as this would introduce unnecessary complexity. Therefore, Ofgem decides to choose a single preferred approach to set the top of the range, and it considers the arithmetic average to be the best available methodology. On this basis, Ofgem determines an ex post TMR estimate based on the 1-year arithmetic return of 6.97 per cent.[35]

**Figure 4.1: Ofgem SSMD estimates of real TMR based on historical ex post analysis**

| Averaging approach | 10yr | 20yr | Dataset |
|---|---|---|---|
| Arithmetic Average (dataset) | | | 6.97% |
| Geometric Average (dataset) | | | 5.27% |
| Geometric Average + Uplift (dataset) | | | 6.82% |
| Arithmetic average (overlapping) | 6.81% | 6.93% | |
| Arithmetic average (non-overlapping) | 6.65% | 6.72% | |
| JKM Unbiased estimator | 6.86% | 6.72% | |
| JKM Minimum MSE estimator | 6.58% | 6.16% | |
| Blume estimator | 6.85% | 6.71% | |

Source: Ofgem analysis incorporating current DMS nominal return data and ONS inflation data

*Source: Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, Table 4.*

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[32]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.93.

[33]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.109.

[34]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.123.

[35]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, paras 3.122-3.123.

Regarding the historical ex ante analysis, Ofgem states that it is cautious about making judgments regarding the extent of previous 'luck' that may apply in the future, as this would require subjective assessments. It also notes concerns about access to Barclays data for non-Barclays clients.[36] Ofgem concludes that the "most effective" ex post methodology is a version of the DMS 'decompositional' approach, as shown in Figure 4.2 below.

**Figure 4.2: Ofgem SSMD ex ante TMR analysis**

| Calculation Step | Description | Figure |
|---|---|---|
| A | Geometric mean dividend yield | 4.55% |
| B | Growth rate of real dividends | 0.75% |
| C = A + B | Geometric mean 'ex ante' TMR | 5.30% |
| D | Geometric-to-arithmetic conversion | 1.65% |
| E = C + D | Raw arithmetic 'ex ante' TMR | 6.95% |
| F | COLI-CED adjustment | -0.35% |
| G | Serial correlation adjustment | -0.10% |
| H = E + F + G | Final arithmetic ex ante TMR estimate | 6.50% |

Source: Ofgem analysis using 2024 DMS returns data and Ofgem's inflation dataset

*Source: Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, Table 5.*

Ofgem argues that its approach does not make subjective assumptions about future re-ratings or changes in likely growth levels, and instead focusses on the estimate of ex ante returns on the historical key return drivers – dividend yield and dividend growth.

Specifically, Ofgem uses 2024 DMS data on historical average dividend yield and adds this to the historical average of dividend growth. Ofgem applies an uplift of 1.65 per cent, based on half of the variance of log real returns, to convert the geometric mean to arithmetic mean. Ofgem then makes a -0.35 percent adjustment to reflect DMS' use of Cost of Living Index (COLI) rather than CED inflation data when calculating real returns. Ofgem recognises the conflicting views as to the presence of serial correlation in the data, but nevertheless applies a -10bps serial correlation adjustment.[37] Overall, Ofgem estimates an ex ante TMR of 6.5 per cent.

For the purpose of the 'early view' of the cost of equity, Ofgem estimates the TMR range of 6.5 per cent (based on the ex ante analysis) to 7.0 per cent (based on the ex post analysis), as shown in Table 4.1 below. As per SSMC, Ofgem continues to believe that it is inappropriate to use forward-looking estimates when setting the TMR in the SSMD. Ofgem also comments that it is more appropriate to present the TMR range in 'rounded' terms.[38]

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[36]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, paras 3.131-3.133.

[37]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, paras 3.135-3.136.

[38]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, paras 3.147-3.149.

**Table 4.1: Ofgem SSMD TMR range**

|             | TMR estimate | Approach                                     |
|-------------|--------------|----------------------------------------------|
| Lower bound | 6.5          | Historical ex ante: DMS decomposition analysis |
| Upper bound | 7.0          | Historical ex post: 1-year arithmetic mean   |

*Source: NERA analysis*

# 4.2.   NERA Comments on Ex Ante TMR

For the historical ex post analysis, Ofgem's SSMD approach aligns with our view that the simple one-year arithmetic mean (AM) is the appropriate unbiased estimator for the purpose of estimating TMR in a regulatory context, as we describe in more detail in section 4.3.

However, Ofgem's estimate of the ex ante historical TMR using DMS data contains a number of errors, and correcting for these errors, we estimate an ex ante TMR of 6.89 per cent, practically in line with the ex post TMR. More fundamentally, we find no reason to rely on historical ex ante methods in the absence of unexpected capital gains in the DMS data, as we explain below.

## 4.2.1.   There is no evidence of P/E expansion in DMS data

We agree with Ofgem's proposed framework for estimating the historical ex ante return based on the seminal Fama and French (2002) dividend growth model (DGM), where the expected TMR is based on the historical dividend yield plus dividend growth.[39,40] Fama and French explain that the DGM excludes that element of historical returns that relate to an apparent decline in discount rates that produces a large unexpected capital gain, in the form of price-earnings or price-dividend expansion. The authors explain that the DGM (or "ex ante historical") allows us to assess whether the ex post historical return is high or low relative to the *expected* value, as the DGM is based on fundamental drivers of expected return and eliminates that element that is related to a decline in investors' discount rates.

Drawing on data from the US market for the period 1951 to 2000, Fama and French found that the DGM provides an expected return that is lower than the realised historical return because the realised historical return includes unexpected capital gains or P/E expansion, which cannot reasonably be expected to persist.[41]

For the UK market, however, the same conclusions do not hold. For the UK market, DMS data shows that there is negligible P/E or P/D expansion, and therefore no grounds to conclude that investors have historically enjoyed an unexpected capital gain. This means that the historical ex post return and DMS or historical ex ante return must be (approximately) equal – and the historical ex post is a reasonable basis for the expected return. These conclusions are in contrast to the evidence from Fama and French for the US market.

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[39] Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.124.

[40] Fama & French (April 2002), The Equity Premium, The Journal of Finance.

[41] Fama & French (April 2002), The Equity Premium, The Journal of Finance, p. 637

## 4.2.2.  Correcting for calculation errors, ex ante TMR equals ex post

As described above, in the absence of P/E expansion, the historical ex post return and DGM method or historical ex ante return must be approximately equal, other than for errors or approximations in the DGM method.

As shown in Table 4.2, we show the close equivalence of the historical ex ante TMR to the historical ex post of 6.97 per cent, correcting for Ofgem's calculation errors.  The corrections are as follows:

- The summation of geometric mean dividend yield and growth rate of real dividends should be geometric as noted by the DMS. Simply adding the components understates the geometric mean.[42]

- Ofgem's DMS GM-AM conversion of 1.65 percent is based on the half variance of the log of the DMS nominal return deflated using the CED/CPIH inflation and not COLI/CPI inflation used by DMS.[43] Therefore, the GM-AM conversion does not actually draw on the real DMS return data, as it uses the incorrect inflation series, and is incorrect.

  – Instead, we calculate a GM-AM conversion of based on half variation of the log of DMS real returns, i.e. using COLI/CPI inflation, of 1.70 per cent. We note that this conversion is in any case an approximation.[44]

- Ofgem uses the COLI-CED adjustment of -0.35 per cent in the SSMD, which references Ofwat's PR24 Final Methodology and the CMA PR19 re-determination.[45] However, the 35bps adjustment at PR19 was based on a comparison of the COLI/RPI and CED/RPI data series, which is not correct. Rather the correct adjustment should be based on a comparison of the TMR estimates using the COLI/CPI, i.e. DMS inflation series, and CED/CPIH, i.e. reflecting the CPIH inflation series that Ofgem will employ at RIIO-3.

  – We calculate the correct COLI-CED adjustment of -0.14 per cent[46].

As well as the computational errors above, there is no requirement to adjust for serial correlation. As Ofgem itself recognises in the SSMD, there are conflicting views on the presence of serial correlation in the UK data, and difficulties in providing a statistically robust estimate.[47]  We summarise the evidence on serial correlation in the section below.

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[42]   DMS states that the summation and subtractions in its decomposition of the historical risk premium are geometric. See, DMS 2024 year book, p.76, Table 12.  For UK data, the sum of DMS geometric mean dividend yield (4.55 per cent), growth rate of real dividends (0.75 per cent), and expansion of P/D ratio (0.03 per cent) is 5.33 per cent. This is lower than summing the components geometrically, which yields 5.37 per cent, exactly the same as the geometric average of annual returns of DMS dataset of 5.37%.

[43]   The DMS 2024 year book uses the following inflation: i) 1900-1948: Cost of Living Index (COLI), ii) 1949-1987: ONS' backcast CPI, and iii) 1988-2023: ONS' actual CPI.  In contrast, Ofgem deflates DMS nominal return using i) 1900-1947: the CED, ii) 1949-1988: ONS' CPIH backcast, and iii) 1988 onwards: ONS' 'actual' CPIH.

[44]   See for example, Wright, S. et al (2003) A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, pp. 24-25.

[45]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.135. Ofwat PR24 Final Methodology, p.34.  CMA, 'PR19 redeterminations: Final Report', pp.825-827, paras 9.353-9.359.

[46]   We calculate this as the difference between 7.11 per cent (DMS' real arithmetic mean return based on COLI/CPI) and 6.97 per cent (Ofgem's calculated AM based on DMS nominal return deflated using CED/CPIH)

[47]   Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.136

## 4.2.2.1.    There is no basis for serial correlation adjustment

Ofgem's own advisers do not provide any firm evidence of predictability of return.  At RIIO-2, the 2018 UKRN report cited evidence of the cyclically adjusted P/E ratio (or CAPE) and its supposed prediction of the end of the 1990s bull run, as the only basis for its assertion of predictability of returns.[48]  However, the earlier 2003 MMW report and an updated report from 2013 by Wright and Smithers[49], the authors considered that the evidence for predictability was contentious. Specifically:

- The 2003 MMW report concluded that predictability of returns was a contentious issue and eminent academics were divided:  "There is no clear cut empirical evidence, that we are aware of […]  Eminent academic economists have come down on both sides of the fence." [50]

- Similarly, Wright and Smithers (2013), in an update to the 2003 MMW report, point out the "evidence of predictability is contentious" and that any evidence is "extremely limited".[51]

Our own review of studies on the topic of predictability also shows that there is a substantive body of research that contests predictability:

- Ang and Beckaert (2007) argue that, although predictability of returns is often taken as a starting point for many studies, fewer studies focus on actually testing for predictability.  The authors themselves find that returns are not predictable at long horizons concluding: "[returns predictability] is not statistically significant, not robust across countries, and not robust across different sample periods. In this sense, the predictability that has been the focus of most recent finance research is simply not there".[52]

- Similarly, Goyal and Welch (2002) classify the predictability of returns in "the long list of great ideas in economics that ultimately failed to live up to expectations".[53]  The authors draw the same findings in further research e.g. Goyal and Welch (2008).[54]

In addition, papers by Boudoukh, Richardson, Whitelaw (2005)[55], Torous, Valkanov, and Yan (2004)[56] and Lanne (2002)[57] do not find evidence for predictability of returns at long horizons.

Based on the above, we conclude that there is no evidence to support Ofgem's adjustment for serial correlation and instead conclude that the evidence on returns predictability remains a highly contentious issue in financial literature.

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[48]    Wright, S. et al, 5 (March 2018) Estimating the cost of capital for implementation of price controls by UK regulators, , pages 39-42.

[49]    Wright & Smither (February 2013) The cost of equity capital for regulated companies: a review for Ofgem,

[50]    Wright et al. (February 2003) A study into certain aspects of the cost of capital for regulated utilities in the U.K., , p.36-37&41-42.

[51]    The cost of equity capital for regulated companies: a review for Ofgem, Wright & Smithers, February 2013, pages8&13.

[52]    Ang & Beckaert (May 2007) Stock return predictability: is it there? p. 28

[53]    Goyal & Welch (February 2002), Predicting the equity premium with dividend ratios, p. 16

[54]    Welch & Goyal (July 2008) A comprehensive look at the empirical performance of equity premium prediction

[55]    Boudoukh, Richardson, Whitelaw (December 2005) The myth of long-horizon predictability

[56]    Torous, Valkanov, Yan (October 2004) On predicting stock returns with nearly integrated explanatory variable

[57]    Lanne (August 2002) Testing the predictability of stock return

## 4.2.2.2. Correction of Ofgem's errors yields similar ex ante TMR as ex post TMR

As shown in Table 4.2: Correction to Ofgem's ex ante TMR analysis, we show the practical equivalence of the historical ex ante TMR to the historical ex post of 6.97 per cent, correcting for Ofgem's calculation errors.

**Table 4.2: Correction to Ofgem's ex ante TMR analysis**

| | | Ofgem's analysis | NERA corrections | Note |
|---|---|---|---|---|
| A | Geometric mean dividend yield | 4.55% | 4.55% | |
| B | Growth rate of real dividends | 0.75% | 0.75% | |
| C= A+ B | Geometric mean 'ex ante' TMR *(DMS' COLI-CPI inflation)* | 5.30% | 5.33% | *Use geometric summation instead of arithmetic summation as per DMS* |
| D | GM-AM conversion | 1.65% | 1.70% | *Ofgem uses half variance of DMS nominal return deflated using CED/CPIH, which is inconsistent with DMS real return which is calculated using COLI/CPI. We use correct DMS real series but note that this is an approximation* |
| E=C +D | Raw arithmetic 'ex ante' TMR *(DMS' COLI-CPI inflation)* | 6.95% | 7.04% | |
| F | COLI-CED adjustment | -0.35% | -0.14% | *Calculating the difference between AM TMR based on COLI-CPI (DMS inflation) and CED+CPIH* |
| G=E +F | Raw arithmetic 'ex ante' TMR *(CED-CPIH inflation)* | 6.60% | 6.89% | |
| H | Serial correlation adjustment | -0.10% | | *No basis for serial correlation adjustment* |
| I=G +H | Final arithmetic ex ante TMR estimate *(CED-CPIH inflation)* | 6.50% | 6.89% | |

*Source: NERA analysis*

As shown above, Ofgem's ex ante historical or DGM estimate realises a lower return (6.5 per cent) compared to the arithmetic historical average (6.97 per cent) because it has made a number of errors in the decomposition analysis.

Once corrected, we calculate an arithmetic ex ante TMR estimate of 6.89 per cent, which is practically identical to the historical ex post TMR estimate of 6.97 per cent.   The difference is in part explained by the small, almost negligible, P/E expansion of 0.03 per cent. The residual

difference is likely to reflect the fact that the GM-AM conversion (step D), based on half the variance of the log return, is an approximation.

## 4.3.    Our Proposed TMR Estimates

In our view, the simple one-year arithmetic mean (AM) is the appropriate unbiased estimator for the purpose of estimating TMR in regulatory context. This is consistent with Ofgem's historical ex post analysis in the SSMD.

In the context of the CMA PR19 appeal, there was a detailed discussion around the different types of potential estimators which were divided into two groups:

- **Estimators of expected returns used for compounding**:  At CMA PR19 (and indeed all recent CMA price control appeals), the CMA and the parties have considered Blume[58] and JKM[59] estimators.  Both developed estimators of expected returns for *the purpose of estimating future values of investment portfolios* when the investment horizon/ holding period is longer than 1 year, i.e. estimators used for the purpose of compounding.  Blume and JKM show that for investment horizons longer than 1 year, the simple arithmetic mean provides an upward biased estimate and the geometric mean a downward biased estimate, and that an unbiased estimator lies between the two, and closer to the arithmetic mean the shorter the investment horizon. (See Table 4.3.)

- **Estimators of expected return used for discounting**: In contrast, Cooper[60] developed an estimator or expected returns for the *purpose of estimating present values of investments* when the investment horizon is longer than one year, i.e. an estimator used for the purposes of discounting.  Cooper shows that for investment horizons longer than 1 year, the arithmetic mean provides a downward biased estimator of expected returns to be used for the purpose of discounting, albeit marginal, e.g. 20 bps for a 10-year investment period.[61]

The relevant estimator is a question of identifying the regulator's objective in setting the allowed return.  The role of the regulator is to set allowed revenues for each year of the price control and the determination of annual revenues requires the use of a simple one-year arithmetic mean (AM) as the appropriate unbiased estimator in setting the expected annual return.

By contrast, the objective of the regulator is not to determine the unbiased estimator for the purpose of estimating future values of investment portfolios (which requires Blume or JKM estimators).  In other words, the problem of estimating the expected future value of an investment portfolio is not the problem facing Ofgem.  Therefore, the Blume and JKM estimators are not relevant.  The Blume and JKM estimators are relevant unbiased estimators for *investors* in regulated assets with longer than 1-year holding periods; but Ofgem is more simply determining the annual return that investors will then adjust (e.g. using Blume) to understand the multi-period expected return.

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[58]    Blume (1974) Unbiased estimators of long-run expected rates of return

[59]    Jacquier, Kane and Marcus (2005) Optimal estimation of the risk premium for the long run and asset allocation: a case of compounded estimation risk

[60]    Cooper (1996) Arithmetic versus geometric mean estimators: setting discount rates for capital budgeting

[61]    Schaefar (February 2020) Using average historical rates of return to set discount rates, page 14

Likewise, we do not consider it is the role of Ofgem to determine an unbiased estimator for the purpose of estimating present values of investments (Cooper adjustment).  The role of Ofgem is not to determine an estimator that provides an unbiased estimate of the present value of capital investment projects for discounters.  Also, it is not the role of the regulator to determine a geometric mean.  It is a mathematical fact that the geometric mean will be lower than the arithmetic mean, and where the difference is explained by the variance in market returns.  However, Ofgem is not determining the return over a period of time, but setting an expected annual allowed rate of return which by consequence of companies' own variance in returns will in turn correspond to a lower expected geometric return over a period of more than one year.

Our view, that the role of the regulator is to determine an annual expected return using arithmetic mean, is consistent with Professor Schaefer submission to the CMA PR19 appeal.  He concluded that

"*[Since the adjustments in the expected return that are required to correct the biases for compounding and discounting are different, it is not possible to provide an expected return that is correct for both but, fortunately, this is not necessary.  [...]  all the CMA needs to do is to provide an unbiased estimate of (say) the expected annual return.  Compounders and discounters will then make their own adjustments to this number to adjust for the bias introduced by the estimate error.*"[62]

Table 4.3 below shows the simple AM estimate as well as the other estimators such as overlapping, Blume, and JKM estimates, as listed by Ofgem in its SSMC as potential estimators. As shown in Table 4.3, using the correct one-year AM supports a TMR of 7.0 per cent (real CPIH). Other estimators, such as overlapping, Blume, and JKM, with longer holding periods provide TMR in the range of 6.2 to 7.0 per cent.

**Table 4.3: Historical TMR estimates using Blume and JKM estimators**

|            | Simple | Overlapping | Blume | JKM |
|------------|--------|-------------|-------|-----|
| 1Y Holding | **7.0** | 7.0 | 7.0 | 7.0 |
| 2Y Holding | 7.3 | 7.0 | 7.0 | 7.0 |
| 5Y Holding | 6.6 | 6.9 | 6.9 | 6.8 |
| 10Y Holding | 6.4 | 6.8 | 6.9 | 6.6 |
| 20Y Holding | 5.9 | 7.0 | 6.7 | 6.2 |

*Source: NERA analysis*

## 4.4.    **Conclusion on TMR**

For the historical ex post analysis, Ofgem's SSMD approach aligns with our view that the simple one-year arithmetic mean (AM) is the appropriate unbiased estimator for the purpose of estimating TMR in the regulatory context.  As explained by Professor Schaefer, the regulator simply needs to provide an unbiased estimate of the expected annual return based on the simple arithmetic mean. The compounders and discounters will then make their own adjustments to this number according to they require unbiased estimates of future investment values in which case,

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[62]    Comments on CMA views on Estimating Expected Returns, Schaefer, 15 April 2020, page 5.

the investors may reasonably rely on Blume or unbiased estimates of the present value, in which case Cooper may apply.

Otherwise, we show that there is limited price-earnings expansion in the DMS data for the UK, and therefore the ex ante historical estimate should be practically identical to the ex post historical estimate save for the negligible P/E expansion of 0.03 per cent. In other words, there is no requirement to adjust the historical ex post DMS data for unexpected capital gains or good luck; that is, the historical ex post provides a reasonable measure of the expected return.

Overall, we estimate TMR of 7.0 per cent based on the annual AM.

We note that our approach to estimating the TMR assumes that it is constant over time and invariant to the RFR, reflecting regulatory practice over successive reviews and consistent with the UKRN guidance.[63] To the extent that the TMR varies positively with the RFR, our approach is likely to understate the TMR during a period of relatively higher interest rates, as per RIIO-3.

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

# 5.    Beta

In this section we set out our comments on Ofgem's beta estimate for RIIO-3 in its SSMD.

## 5.1.    Ofgem SSMD Decision on Beta

In the SSMD, Ofgem states that it will calculate the beta using the methodology in the SSMC – i.e. it will base the beta analysis on OLS regressions of relevant listed comparators.[64] Ofgem states that it will de-gear these to assess unlevered asset betas, combine these estimates with a debt beta assumption to make asset beta comparisons, and then re-gear these estimates to the relevant notional level of gearing to estimate an appropriate equity beta for the CAPM cost of equity.

For its "early view" of the cost of capital, Ofgem presents a beta range considering data across 2, 5 and 10-year timeframes, but states that at DDs and FDs it anticipates relying most heavily on longer-term (10-year) timeframes when picking a point estimate for asset beta.[65] It relies on data across 2, 5 and 10-year timeframes in order to allow a wider range of estimates at this early stage.[66] Ofgem also states that it will focus on betas based on daily observations, as was the case at RIIO-2, and that it will "*further assess the systematic risks that companies face as we progress towards FDs*", but wants to retain the flexibility to pick a point estimate that it considers best matches the systematic risk exposure companies face on a forward-looking basis.

Ofgem states its intention at SSMD to include relevant European utility comparators in addition to UK water companies and National Grid plc when measuring beta.[67] However, it does not intend to include construction company data or make manual adjustments to beta estimates as suggested by some network companies.

Ofgem proposes a debt beta estimate of 0.075 – which it states is: i) the same estimate used in RIIO-2; and, ii) in line with recent precedent. Ofgem notes that the CMA in the RIIO-2 appeal concluded that Ofgem's debt beta estimate represented an appropriate reflection of the balance of evidence, and was 'not wrong'.[68] Ofgem further states that it has not identified any evidence that would support a different decision for RIIO-3.

For the early view of the cost of equity, Ofgem concludes on a "wide" asset beta range of 0.30 - 0.40, which translates to a regeared equity beta range of 0.64 - 0.89 at 60 per cent gearing, assuming a debt beta of 0.075.[69]

## 5.2.    NERA Comments on SSMD Beta Guidance

We have reviewed Ofgem's SSMD guidance for the beta, and we have identified the following potential issues with Ofgem's approach:

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[64]    Ofgem (18 July 2024), RIIO-3 Sector Specific Methodology Decision – Finance Annex, para 3.157.

[65]    Ofgem (18 July 2024), RIIO-3 Sector Specific Methodology Decision – Finance Annex, para 3.172.

[66]    Ofgem (18 July 2024), RIIO-3 Sector Specific Methodology Decision – Finance Annex, para 3.175.

[67]    Ofgem (18 July 2024), RIIO-3 Sector Specific Methodology Decision – Finance Annex, para 3.192.

[68]    Ofgem (18 July 2024), RIIO-3 Sector Specific Methodology Decision – Finance Annex, para 3.208.

[69]    Ofgem (18 July 2024), RIIO-3 Sector Specific Methodology Decision – Finance Annex, para 3.216.

- NG's beta evidence should be interpreted with caution, given that its beta is likely to be affected by M&A activity and UK regulated activity constitutes around only 40 per cent of its enterprise value;

- Ofgem should not rely on water sector beta evidence, which is of limited relevance to the UK gas and electricity sectors;

- Ofgem's chosen European T&D beta comparator set may exclude relevant comparators;

- Ofgem should consider a premium or uplift for additional beta risks UK networks expects to face over RIIO-3 related to Net Zero expenditure.  Empirical/ regulatory evidence supports a wide range of between 0.02 and 0.2.

## 5.2.1.  Ofgem is incorrect to include National Grid as a Comparator

As set out above in this section, Ofgem's proposed UK utilities comparator set at SSMD is comprised of:

- UK water sector utilities; and

- National Grid.

National Grid is a potentially problematic comparator for UK networks, as:

- Its beta has been strongly affected by M&A activity, as well as other idiosyncratic events; and

- UK regulated activity constitutes a minority of its overall operations.

**National Grid M&A activity**

National Grid has carried out considerable M&A activity since 2021, which has impacted National Grid's equity returns. For example, in 2021 National Grid announced a strategic pivot towards electricity and away from its gas network businesses.  National Grid acquired Western Power Distribution (WPD), the UK largest electricity distribution network, in March 20021 at an equity value of £2.7 billion.[70]  At the same time, National Grid divested from the US network business by selling its stake in Rhode Island utility company Narragansett for USD 3.8 billion.[71]  National Grid also announced the sale of its UK gas transmission business, completing a 60 per cent sale for £2.2 billion (valuing the entire business at £9.6 billion) in March 2022, a further 20 per cent sale for £700 million in July 2023 and then agreed the sale of its final 20 per cent stake in July 2024.[72]  This activity is likely to continue beyond our information cut-off date, with National Grid agreeing to sell its ESO for £630 million on 13 September 2024.[73] As well as networks, National Grid has sold off a stake in property development business St Williams Group in March 2022, agreed the sell-off of smart meter asset provider NG Smart in September 2023 and acquired engineering and design consultancy Premtech in April 2024.

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[70]   Investors' Chronicle (19 March 2021), National Grid charges up with £7.8bn electricity acquisition,

[71]   PR Newswire (25 May 2022), PPL Corporation completes acquisition of Rhode Island's primary electric and natural gas utility.

[72]   National Grid (27 March 2022), Sale of majority interest in NGGT and Metering; Morningstar (26 July 2024) Macquarie buys National Grid's remaining stake in National Gas.

[73]   Reuters (13 September 2024) UK's National Grid to sell electricity system operator in $827 million deal.

The below figure sets out key points where NG's share price movement has been out of sync with the market.  As can be seen, there are several periods where low correlation between NG's total return and the market coincides with news on M&A activity/other idiosyncratic National Grid news – see for example May 2024, where NG's rights issue resulted in a substantial decline in total return compared to the benchmark index, followed by a steady rise until September 2024 (whereas the benchmark index remained stagnant).  The implication is that M&A/idiosyncratic events are resulting in a lower correlation between Grid's returns with the market and a decline in beta value.

**Figure 5.1: National Grid vs Benchmark Market Return, 2020-2023**
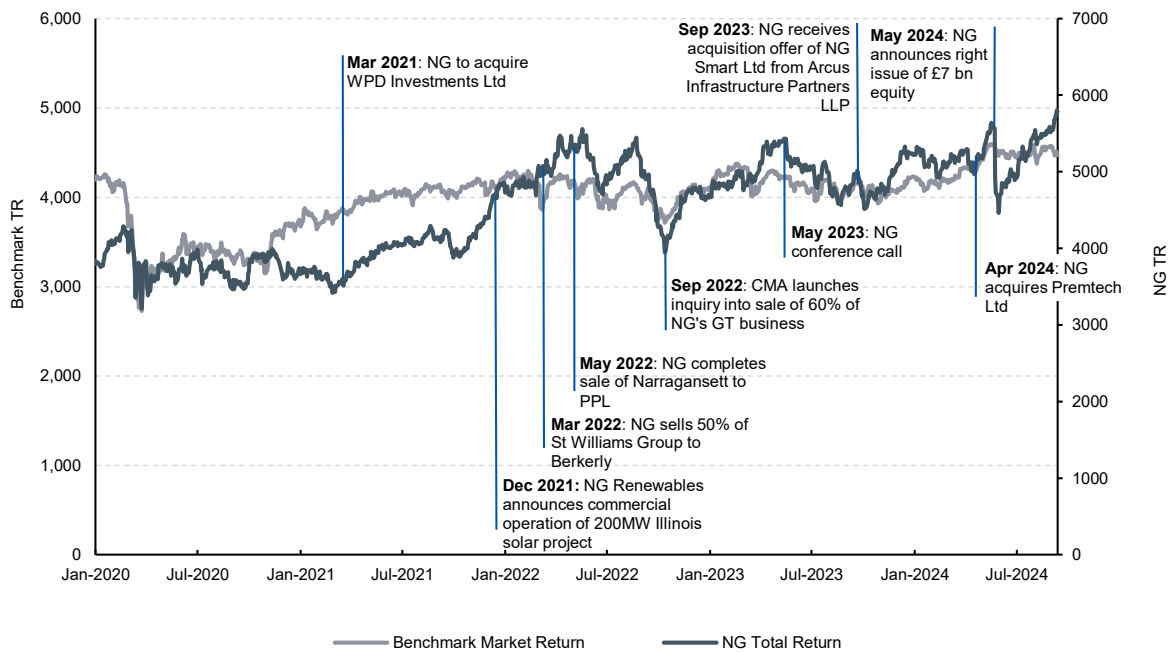


*Source: NERA analysis of FactSet financial market data.*

The implications of the above evidence are that National Grid's beta is likely to be affected by its M&A activity rather than the forward looking prospects of its UK regulated network operations (among other business lines).

**National Grid non-UK regulated activity**

Aside from its substantial M&A activity, National Grid's empirical beta is likely to be significantly affected by its non-regulated and US operations, which historically contribute the majority of National Grid's revenue and operating profit as set out in Table 5.1 below.

**Table 5.1: National Grid UK Regulated Revenue and Profit as % of Total. 2022-2024**

| Year End | March 2022 | March 2023 | March 2024 |
|---|---|---|---|
| National Grid % of revenue from UK regulated activity | 37.6% | 39.9% | 41.5% |
| National Grid % of operating profit from UK regulated activity | 45.0% | 47.1% | 67.7% |

*Source: NERA analysis of National Grid annual report data for 2022-2024.*

Beyond this historical evidence of National Grid's financial data, equity analyst reports between 2017 and 2024 are generally aligned in attributing the majority of National Grid's enterprise value to its US and non-regulated operations – in particular, the RAV of National Grid's UK regulated assets as a percentage of National Grid's total enterprise value (based on analyst estimates) ranges from 35.2 per cent to 48.5 per cent over the 2017-2024 period, as set out in Table 5.2 below.

**Table 5.2: Equity Analyst Estimates of National Grid UK Regulated RAV as % of Total EV, 2017-2024**

| Year | Average equity analyst estimate of NG's UK regulated RAV as % of total EV |
|---|---|
| 2017 | 44% |
| 2018 | 40% |
| 2019 | 39% |
| 2020 | 36% |
| 2021 | 43% |
| 2022 | 49% |
| 2023 | 42% |
| 2024 | 41% |

*Source: NERA analysis of equity analyst reports on National Grid from JP Morgan, RBC, Societe Generale and Edison.*

National Grid's beta is therefore likely to more closely reflect its US and non-regulated activities than its UK regulated activities.  We also consider that its US businesses are likely to face lower beta risk than UK businesses, implying that National Grid's group beta understates the beta for its UK assets.  For example, we have previously identified that US regulatory regimes are lower risk for the following reasons:[74]:

• Greater objectivity in setting allowed costs: in most cases, cost allowances are set based on outturn costs for a base year and projected forwarded, without explicit efficiency factors that reduce allowance over time. Some are also based on historical costs.  The prudency standard for permissible costs sets a high evidentiary bar for the disallowance of incurred costs.[75]  By

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[74]  NERA (2018) RIIO-2 Beta and Risk Assessment, pp. 11-12

[75]  See NERA (2015) Half a century of estimating the cost of capital, Link: http://www.nera.com/content/dam/nera/publications/2015/PUB_Cost_of_Capital_1115.pdf

contrast, RIIO draws on more subjective comparative efficiency analysis and technical review of costs;

• US regimes provide a true-up for pension and other post-employment liabilities, whereas NGET and NGGT bear the risk on their post-2012 liabilities;

• US companies generally have less stringent or financial performance related output and quality of service incentives (mainly around reducing and preventing gas leakage and some efficiency incentives);

• The US regimes incorporate greater use of cost pass-through or true-ups, e.g. for commodity prices, commodity related bad debt, some mandated capex, and environmental remediation costs.  By contrast, the true-ups or pass-through provisions for NGET and NGET are more limited, e.g. relating to security, network development, infrastructure enhancement, strategic wider works, and some environmental costs.

• The US regimes tend to have relatively short regulatory periods (mostly 3-4 years), which provides for frequent updating of allowed revenues in line with costs, and hence a relatively low within-period volatility of returns. [76]

• US regulatory regimes are determined with reference to case law which has been tested in the courts.  The nature of the proceedings offers greater investor security relative to the more subjective approach, and weaker appeals mechanisms, associated with GB price controls.  For example, the rate cases have enshrined principles in relation to the protection of property rights, and notions of prudency standards in relation to permissible costs.[77]

For these reasons, National Grid's group beta is of limited relevance to the beta risk of UK assets, or alternatively, the group beta should be interpreted as a lower bound.

## 5.2.2.  Ofgem is incorrect to include UK water sector comparators

Ofgem has reiterated its intention to rely on UK water sector beta evidence, including United Utilities and Severn Trent, as it did at RIIO-2.  This is despite its own empirical analysis at RIIO-2 indicating that water companies face significantly lower risks than energy networks.  For example, notwithstanding the impact of US and non-regulated activity on NG's beta as we explain above, Ofgem's calculations covering a five year period as at RIIO-2 showed significantly lower betas for pure-play water companies compared to NG.[78]

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[76]  We understand that in practice NG can file more frequently than the duration of the price controls, as stated here and more recently looks to file every one to three years.

[77]  The regulation of utilities in North America faces a special kind of constraint that most other nations do not exhibit. Particularly in the United States, major regulatory statutes do not become settled methods of government control over private businesses until they are tested in the courts.  There are established principles in relation to property rights, and prudency standards.  See: NERA (2015) Half a century of estimating the cost of capital, Link: http://www.nera.com/content/dam/nera/publications/2015/PUB_Cost_of_Capital_1115.pdf

[78]  RIIO-2 Draft Determinations – Finance Annex, Ofgem, 4 September 2020. Figure 8, page 44.

Indeed, while the regulatory regimes in energy and water are closely aligned, a comparative risk analysis shows that investors in TOs face higher risk than investors in water networks (and indeed other energy networks) for a number of reasons.

First, there are greater system operability risks associated with TOs. For example, TOs face unique network reliability risks from risks surrounding network frequency, voltage, stability, and thermal constraints.[79]

Secondly, the government's decarbonisation agenda is driving significant changes in the energy supply market with traditional sources of energy supply replaced with a divergent mix, with material implications for TOs. Over RIIO-2 and 3, TOs face a significant programme of investment to connect new sources of generation and to improve interconnectivity between transmission areas. They also face the challenge of moving from an electricity transmission system where thermal sources of generation can be called upon when required to one which has to address the challenge of the intermittency of renewable generation.

Thirdly, TOs face greater risk from the size and complexity of investment. In RIIO-1, Ofgem noted that companies with a higher capex to RAV ratio were more exposed to cash flow risks and thus higher risk than those with smaller capex programmes.[80] The Table below compares the capex to RAV ratios of SPT, GDN's and UK water companies at the most recent price controls. As shown in Table 5.3, SPT has higher capex to RAV ratios than GDNs and water companies at RIIO-2, implying greater relative capex size and higher investment risks for SPT compared to GDNs and water networks.

**Table 5.3: SPT faces higher capex risk than UK GD and Water**

| Capex/opening RAV | SPT | | | Water | | |
| --- | --- | --- | --- | --- | --- | --- |
| | RIIO-1 | RIIO-2 | RIIO-3 | PR14 | PR19 | PR24 |
| | 15% | 9-19% | 25-30% | 6-8% | 6-7% | 5-6% |

*Note: For GDN's, the RIIO-2 range is based on baseline totex (lower bound) and illustrative totex (upper bound). For SPT, the RIIO-2 range is based on baseline totex (lower bound) and totex under the Net Zero scenario (upper bound). For Water companies, the PR19 range is based on WaSC average (lower bound) and WOC average (upper bound), while the PR24 range is based on WaSC average (upper bound) and WOC average (lower bound). SPT RIIO-3 is based on SPT business plan financial model (BPFM).*
*Source: NERA-analysis of Ofwat 2024 DD.*

In conclusion, TOs face risks in relation to the decarbonisation agenda that are likely to explain higher beta risk. TOs also face greater capex risks, as evidenced by higher capex to RAV ratios relative to other networks. This is supported by the empirical evidence which shows higher beta risk for NG relative to water networks over a sustained period, bar the more recent period where we have observed market decoupling. Ofgem is therefore wrong to suggest that water networks are reasonable proxies for GB transmission networks.

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[79] See e.g. Operability Strategy Report 2021, National Grid, December 2020, page 7.

[80] RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, Ofgem, December 2012, para 3.17, page 14.

## 5.2.3.  Ofgem should expand its European Utility Comparator Set

We welcome Ofgem's decision to include European network companies in its comparator set for calculating the beta allowance at RIIO-3.  The key advantage of European networks is that they provide the only source of relevant "pure-play" listed electricity and gas network comparators.

We note that comparator set cited by Ofgem in the SSMD is comprised of Red Electrica Corporacion (Spain), Terna (Italy), Snam (Italy), Enagas (Spain) and Italgas (Italy).  We have conducted our own review of European network utilities to find suitable comparators at RIIO-3, and screen for appropriate comparators based on i) liquidity of stock and ii) involvement in regulated utility activity.  Below we set out a list of comparators by liquidity, and proportion of revenue and EBITDA generated from regulated activities.

**Table 5.4: Additional Equity Screens for Relevance and Liquidity**

| Comparator | >50% Revenue and Operating Profit from Regulated Activity? | Bid-Ask Spread <1%? | Trade Volume, thousands (5Y average) | Include in NERA Comparator Set? | Included by Ofgem |
|---|---|---|---|---|---|
| Red Electrica Corp | Yes | Yes | 1,674 | **Yes** | **Yes** |
| Terna | Yes | Yes | 4,969 | **Yes** | **Yes** |
| Elia | Yes | Yes | 59 | **No** | **No** |
| REN | Yes | Yes | 733 | **No** | **No** |
| Snam | Yes | Yes | 8,052 | **Yes** | **Yes** |
| Enagas | Yes | Yes | 1,139 | **Yes** | **Yes** |
| A2A | No | Yes | 10,335 | **No** | **No** |
| Hera | Yes | Yes | 3,070 | **Yes** | **No** |
| Transelectrica | No | Yes | 16 | **No** | **No** |
| Fluxys | Yes | No | 2 | **No** | **No** |
| Enel | No | Yes | 26,872 | **No** | **No** |
| Endesa | No | Yes | 1,493 | **No** | **No** |
| Italgas | Yes | Yes | 1,966 | **Yes** | **Yes** |

*Source: NERA analysis*

Based on the analysis above, we conclude that Hera is a relevant comparator to add to the European comparator set, alongside the five comparators already identified by Ofgem.  60 per cent and 82 per cent of Hera's revenue and EBITDA, respectively, are generated from regulated activity in energy networks, including gas and electricity distribution.[81]

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[81]  Based on NERA analysis of Hera financial data from FactSet. Hera is also involved in water network activities – including revenue and operating profit from these activities would result in 76 per cent of Hera's revenue and 88 per cent of Hera's EBITDA being from regulated activities.

Based on a revised comparator set consisting of i) the comparators used by Ofgem in its early view beta analysis and ii) Hera as a suitable additional comparator, we find that the latest European T&D beta evidence supports a beta in the range of 0.38-0.44.

Table 5.5 below sets out the individual and summary statistics.

**Table 5.5: European Comparator Asset Betas by Estimation Window and Averaging Period**

|  |  | **2-yr est. window** | | | | **5-yr est. window** | | | | **10-yr est. window** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Avg Period** |  | Spot | 2Y | 5Y | 10Y | Spot | 2Y | 5Y | 10Y | Spot | 2Y | 5Y |
| Red Electrica | Elec | 0.40 | 0.27 | 0.30 | 0.36 | 0.32 | 0.31 | 0.34 | 0.39 | 0.36 | 0.36 | 0.38 |
| Terna | Elec | 0.47 | 0.40 | 0.43 | 0.44 | 0.45 | 0.44 | 0.45 | 0.44 | 0.45 | 0.44 | 0.44 |
| Snam | Gas | 0.46 | 0.40 | 0.45 | 0.46 | 0.46 | 0.47 | 0.48 | 0.46 | 0.46 | 0.46 | 0.46 |
| Enagas | Gas | 0.38 | 0.27 | 0.34 | 0.37 | 0.36 | 0.36 | 0.38 | 0.40 | 0.38 | 0.38 | 0.40 |
| Italgas | Gas | 0.38 | 0.39 | 0.40 |  | 0.38 | 0.40 |  |  |  |  |  |
| Hera | Mix | 0.55 | 0.55 | 0.53 | 0.44 | 0.53 | 0.53 | 0.48 | 0.43 | 0.46 | 0.44 | 0.43 |
| **Average** | **Total** | **0.44** | **0.38** | **0.41** | **0.41** | **0.42** | **0.42** | **0.43** | **0.42** | **0.42** | **0.42** | **0.42** |

*Notes: All asset betas are calculated based on a debt beta assumption of 0.075. All beta estimates based on information cut-off date of 10 September 2024; Comparators are classified into electricity, gas or mix companies according to their business descriptions and revenue breakdowns (categorized as electricity or gas if over 90 per cent of revenue generated from the source within the utilities sector). Source: NERA Analysis of financial market data from FactSet.*

## 5.2.4.  Impact of Additional Risks on Appropriate Beta

SPT's beta over the RIIO-3 period may also be affected by additional risks, which warrant a further uplift to its beta as they are not reflected in historical empirical beta evidence.

By construction beta estimates are backward-looking and sluggish in detecting structural, fundamental changes in a company's exposure to systematic risk.

Capex related risks

We understand that SPT anticipates unprecedented levels of investment over the next price control, e.g., with totex more than two times current levels. For SPT in particular, current forecasts of totex:RAV over RIIO-T3 lie in the range of 25-30 per cent on average – far higher than over RIIO-T2, as set out in Table 5.3 above.

Regulators have previously accepted that an uplift to cost of equity via beta is justified due to large capital programmes. For example:

- At RIIO-1, Ofgem used the capex:RAV ratio to measure riskiness of capex programmes[82] and has recognised higher construction risk for TO projects. As a result, Ofgem decided on a cost of equity allowance of 7 per cent for SHETL, at the top end of the 6.0-7.2 per cent range that it

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[82]   Ofgem (Feb 12), RIIO-T1: Initial Proposals for SP Transmission Ltd and Scottish Hydro Electric Transmission Ltd, para 5.19 and Ofgem (Dec 12), RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas – Finance Supporting Document, para 3.25.

determined for other TOs.[83]  The implied asset beta was 0.45 compared to an industry-wide asset beta of 0.32.[84]

- The Utility Regulator (UR) in Northern Ireland has also recently considered totex:RAV for setting allowed return for NI gas distribution networks (GDNs) indicating that variations in such measures could contribute around 0.02 beta variation.[85]

- Rating agencies also examine capex to RAV as a measure of credit risk.[86]

- At previous price control appeals, the CMA has also allowed for higher beta to reflect higher operational leverage.  Operational leverage is a measure of the cost fixity of the business, and is akin to financial leverage in terms of its impact on beta. The higher the cost fixity of a business, the greater the volatility of returns for any given shock and the greater the beta risk.[87] In its consideration of Bristol Water's appeal of Ofwat's PR14 decision, the CMA noted that Bristol Water's operating cash-flow to revenue was 45 per cent compared to 51 per cent for the listed comparators.  This means that Bristol Water has a reduced cash cushion to withstand any shock, and the CMA allowed for a 13 per cent uplift to the industry beta or around 0.03 uplift.[88]

- For Hinkley Seabank, Ofgem set out a high end of the beta range based on construction company beta evidence, in order to reflect relevant risks during the construction phase of the project.[89]  Ofgem advisers estimated an asset beta of between 0.45 and 0.65. [90]

The challenge here is to make a mechanistic adjustment for capex risk to necessarily backward looking beta evidence.  The adjustments vary substantively: from around 0.02 to around 0.2. However, overall, the evidence demonstrates that higher capex:RCV increases beta risk and substantively so.  This can be seen in the steady growth of electricity and gas transmission and distribution betas in recent years, which may be indicative of the market pricing in energy transition risk.

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[83]   This cost of equity allowance was based on SPT's own business plan submission at RIIO-T1 Initial Proposals, which Ofgem accepted.  Ofgem (Feb 12), RIIO-T1: Initial Proposals for SP Transmission Ltd and Scottish Hydro Electric Transmission Ltd, p.19.

[84]   See CEPA (2018) Review of cost of capital ranges for new assets for Ofgem's network division, p. 55.

[85]   Utility Regulator (Oct 22), GD23 – Gas Distribution Price Control 2023-2028, Final Determination – Main Report, pp.86-88 and First Economics (Sep 22), An Estimate of the GD23 Cost of capital, prepared for the Utility Regulator, pp.4 and 6.

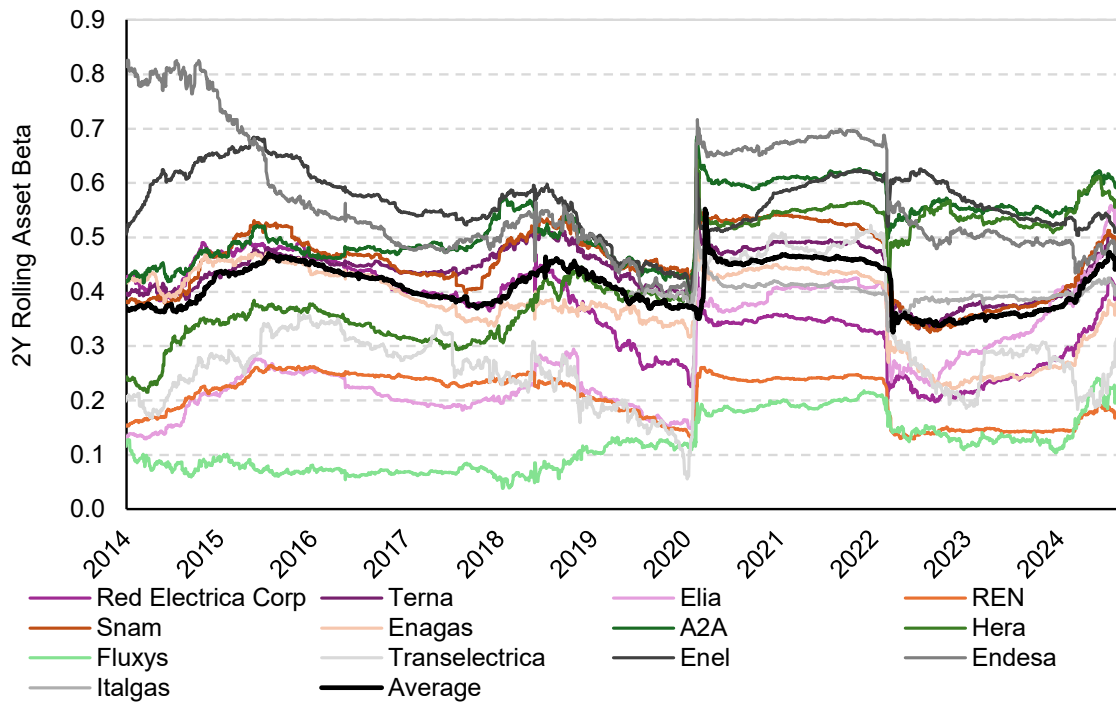[86]   Moody's (Apr 22), Rating Methodology, Regulated Electric and Gas Networks, p.11.

[87]   The CMA notes that there is a straightforward theoretical case that operational gearing should have a positive impact on asset beta – as it is comparable in effects to financial gearing.  However, CMA also acknowledged that: "[...] it is difficult to identify a particular relationship between the actual form of operational gearing for water companies and the level of asset beta [...]  For example, operational gearing is different from financial gearing in that there is no measurable balance sheet obligation." CMA (Oct 15), Bristol Water plc, Appendix 10.1, para. 124.

[88]   CMA (Oct 15), Bristol Water plc, Appendix 10.1, para. 65.

[89]   Ofgem (September 2020), Update on Competition Proxy delivery model, para 1.20.

[90]   See CEPA (2018) Review of cost of capital ranges for new assets for Ofgem's network division, p. 55.

**Figure 5.2: Electricity and Gas T&D Betas have Steadily Increased since 2022**



Legend:
- Red Electrica Corp
- Terna
- Elia
- REN
- Snam
- Enagas
- A2A
- Hera
- Fluxys
- Transelectrica
- Enel
- Endesa
- Italgas
- Average

Y-axis: 2Y Rolling Asset Beta

Greater regulatory risks

Another risk factor for SPT that may require a further beta adjustment for RIIO-3 is the risk of changes in the regulatory framework, as set out in Ofgem's consultations on the future systems and network regulation (FSNR), Accelerated Strategic Transmission Investment (ASTI) and inflation.

The FSNR consultation considered three alternative types of regulation for the next price control:

- A "Plan and Deliver" model, under which the FSO identifies new investments and procures these directly, for example through competitive tendering.

- An adapted version of the current "Ex-ante Incentive Regulation" model, with i) updated outputs and incentives tailored to meet decarbonisation challenges, and ii) simplified cost incentives for "business as usual" activities (e.g., the use of RPI-X or ex-post cost assessment for these business areas);

- A "Freedom and Accountability" model under which Ofgem determines the outputs and licensees chose the delivery model, which Ofgem then assesses on an ex-post basis. This would resemble the cost-plus rate of return approach as commonly used in the USA.

Ofgem's overarching decision on the framework for ET (and indeed GT and GD) is that it will "resemble an evolution of RIIO-2 for on-going activities".

Alongside the development of RIIO-3, Ofgem will implement a parallel regime for the review of major projects that are needed to meet the strategic challenges and where the timeline for decision-making will not necessarily fit with that for a RIIO-style price control – and has specifically identified ET as a priority. Ofgem has determined that it will use the Centralised Strategic Network Plan (CSNP) as the process for identifying need.

Ofgem has also stated that "competition for the market" should remain an option for delivery of large new infrastructure, particularly in ET, but Ofgem expects the large majority of projects to be designed and procured by TOs during T3. Ofgem's decision for new investment, where the project need is determined by the FSO, is to build upon the current Accelerated Strategic Transmission Investment (ASTI) process to provide staged approvals for major projects, with Ofgem focussed on reviewing the TO procurement process.

In December 2022, Ofgem decided to implement the ASTI framework, which aims to accelerate the delivery of onshore electricity network upgrades to meet the Government's ambition of connecting up to 50GW of offshore wind generation to the network by 2030.

The ASTI framework replaces the current Large Onshore Transmission Investment (LOTI) regulatory framework for large load-related projects (over £100m) that are required for the Government's 2030 ambition.

The framework includes changes to the project approval and funding process, reducing the number of steps in the regulatory process. Under the ASTI process, TOs can access preconstruction funding of 2.5 per cent of the total forecast totex for qualifying projects, without an assessment of the proposed activities and costs by Ofgem. TOs are then able to access early-construction funding of up to 20 per cent of forecast totex, subject to a light-touch assessment of the activities by Ofgem, without a cost assessment. Ofgem will only conduct a full cost assessment to determine the totex allowances after planning applications have been submitted.

Besides changing the project approval process, the other main feature of the framework is the exemption of projects from competition through tendering, with the incumbent TOs confirmed as the delivery bodies of ASTI projects.

Ofgem included 26 projects in the ASTI framework, at total expected cost of £19.8bn.[21] The planned ASTI expenditure in the RIIO-2 period is £3.1bn, with the majority expected to be incurred in the next price control period.

Out of the 26 ASTI projects, 4 are allocated to SPT (including SPT with SSE or NGET). These new investment projects could change SPT's risk and return profile, and thus the financial package required in future price controls. Ofgem decided to conduct a financeability assessment of the ASTI (and other) investment only at the next price control review.

## 5.3.    Conclusion on beta

Above in this section we set out the following comments on Ofgem's SSMD guidance for the beta at RIIO-T3:

- NG's beta evidence should not be relied upon, given that its beta is likely to be affected by M&A activity and UK regulated activity is only a minority of its activity. To the extent it is relied upon, it constitutes a lower bound

- Ofgem should not rely on water sector beta evidence, which is of limited relevance to the UK gas and electricity sectors;

- Ofgem should determine beta based on European T&D beta comparator set as the only pure-play energy networks. Ofgem should extends it set of five European comparators to six to include Hera; and

- Ofgem should consider a premium or uplift for additional beta risks UK networks expects to face over RIIO-3 related to Net Zero expenditure

Beta evidence based only on European comparators (i.e. excluding National Grid and UK water companies), and including Hera in the European comparator set as we recommend, results in a beta range of 0.38-0.44, as shown in Table 5.6 above compared to Ofgem's "early view" beta range of 0.30 to 0.40 set out at SSMD.

Given the additional totex risk and the likely impact this will have on beta over RIIO-3, we would recommend Ofgem to consider the upper end of our proposed beta range , and we consider the evidence broadly supports a range of 0.40 to 0.45, with a point estimate of 0.425.

**Table 5.6: NERA's European Comparator Set Yields an Asset Beta Range of 0.38-0.44**

| Estimation window | Averaging period | Ofgem comparator set | NERA European set | |
|---|---|---|---|---|
| 2-year | Spot | 0.41 | 0.44 | +0.03 |
| | 2-year | 0.33 | 0.38 | +0.05 |
| | 5-year | 0.36 | 0.41 | +0.05 |
| | 10-year | 0.38 | 0.41 | +0.03 |
| 5-year | Spot | 0.37 | 0.42 | +0.05 |
| | 2-year | 0.36 | 0.42 | +0.05 |
| | 5-year | 0.37 | 0.43 | +0.05 |
| | 10-year | 0.39 | 0.42 | +0.04 |
| 10-year | Spot | 0.38 | 0.42 | +0.04 |
| | 2-year | 0.38 | 0.42 | +0.04 |
| | 5-year | 0.38 | 0.42 | +0.04 |

*Note: all table values are asset betas with a 0.075 debt beta assumption.  Source: NERA analysis of financial market data on FactSet.*

# 6.   Conclusions on CAPM Cost of Equity

Table 6.1 summarises Ofgem's early view cost of equity compared to our estimate. Ofgem's SSMD provides a cost of equity range of 4.57-6.35 per cent at 60 per cent gearing, below our estimated range of 6.49-7.06 per cent.

**Table 6.1: Ofgem's SSMD Cost of Equity Range and NERA (@60 per cent gearing)**

|  | Ofgem SSMD | | NERA estimate | |  |
| --- | --- | --- | --- | --- | --- |
|  | Low | High | Low | High |  |
|  |  |  |  |  | **Comment** |
| [A] Risk-Free Rate | 1.18% | 1.18% | 2.44% | 2.44% | Ofgem based on ILG plus RPI-CPI wedge; NERA based on nominal gilt minus LT CPI forecast |
| [B] Asset Beta | 0.30 | 0.40 | 0.40 | 0.45 | Ofgem based on UK and European comparators; NERA based on European comparators, aimed up to reflect T3 totex risk |
| [C] Equity Beta | 0.64 | 0.89 | 0.89 | 1.01 | Based on debt beta of 0.075, observed gearing of 50% and notional gearing 60% |
| [D] TMR | 6.50% | 7.00% | 7.0% | 7.0% | Ofgem based on historic ex post and ex ante evidence; NERA based on historical AM of annual returns |
| **[E] Cost of Equity (@60 per cent gearing)** | **4.57%** | **6.35%** | **6.49%** | **7.06%** | [A] + [C] * ([D] - [A]) |

*Note: Asset Beta is calculated based on 0.075 debt beta, for both Ofgem SSMD and NERA estimates. Source: Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, Table 13; NERA analysis.*

Table 6.2 sets out our respective CAPM estimates at 55 per cent gearing, as per Ofgem's notional gearing assumption for TOs. At 55 per cent gearing, we estimate a cost of equity range of 6.08 to 6.58, and a mid-point of 6.33 per cent.

**Table 6.2: Ofgem's SSMD Cost of Equity Range and NERA (@55 per cent gearing)**

|  | Ofgem SSMD | | NERA estimate | | |
|---|---|---|---|---|---|
|  | Low | High | Low | High |  |
|  |  |  |  |  | Comment |
| [A] Risk-Free Rate | 1.18% | 1.18% | 2.44% | 2.44% | Ofgem based on ILG plus RPI-CPI wedge; NERA based on nominal gilt minus LT CPI forecast |
| [B] Asset Beta | 0.30 | 0.40 | 0.40 | 0.45 | Ofgem based on UK and European comparators; NERA based on European comparators, aimed up to reflect T3 totex risk |
| [C] Equity Beta | 0.58 | 0.80 | 0.80 | 0.91 | Based on debt beta of 0.075, observed gearing of 50% and notional gearing 55% |
| [D] TMR | 6.50% | 7.00% | 7.0% | 7.0% | Ofgem based on historic ex post and ex ante evidence; NERA based on historical AM of annual returns |
| **[E] Cost of Equity (@55 per cent gearing)** | **4.24%** | **5.82%** | **6.08%** | **6.58%** | **[A] + [C] * ([D] - [A])** |

*Note: Asset Beta is calculated based on 0.075 debt beta, for both Ofgem SSMD and NERA estimates. Source: Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, Table 13; NERA analysis.*

# NERA

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NERA
Marble Arch House
66 Seymour Street
London W1H 5BT, UK
www.nera.com