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Cost of Equity for RIIO-T3 – Response to Ofgem's DD

A report for Scottish Power Transmission

20 August 2025

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1. Summary

Scottish Power Transmission (SPT) commissioned NERA Economic Consulting to review Ofgem's cost of capital a set out in its recent RIIO-3 Draft Determination (DD). 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 DD cost of equity compared to our estimate. Overall, we estimate a range of 6.13 to 6.65 which lies substantively above Ofgem's cost of equity range of 4.76-6.45 per cent.

Table 1: Ofgem's DD Cost of Equity Range of 4.76-6.45 per cent lies below NERA's Range of 6.13-6.65 per cent (@55 per cent gearing)

	Ofgem DD			NERA estimate		
	Low	**High**	**Proposed**	**Low**	**High**	
						Comment
[A] Gearing	55%	55%	55%	55%	55%	
[B] Risk-Free Rate	2.01%	2.01%	2.01%	2.73%	3.13%	Ofgem: based on ILG NERA: based on nominal gilts less long-run CPIH forecast
[C] TMR	6.8%	6.9%	6.9%	7.0%	7.0%	Ofgem: ex post and ex ante NERA: ex post
[D] Asset Beta (debt beta 0.075)	0.30	0.45	0.375	0.40	0.45	Ofgem: GB and EU comparators NERA: EU comparators
[E] Equity beta	0.58	0.91	0.74	0.80	0.91	Calc.
[F] Cost of Equity	4.76%	6.45%	5.64%	6.13%	6.65%	**[B] + [E] * ([C] - [B])**

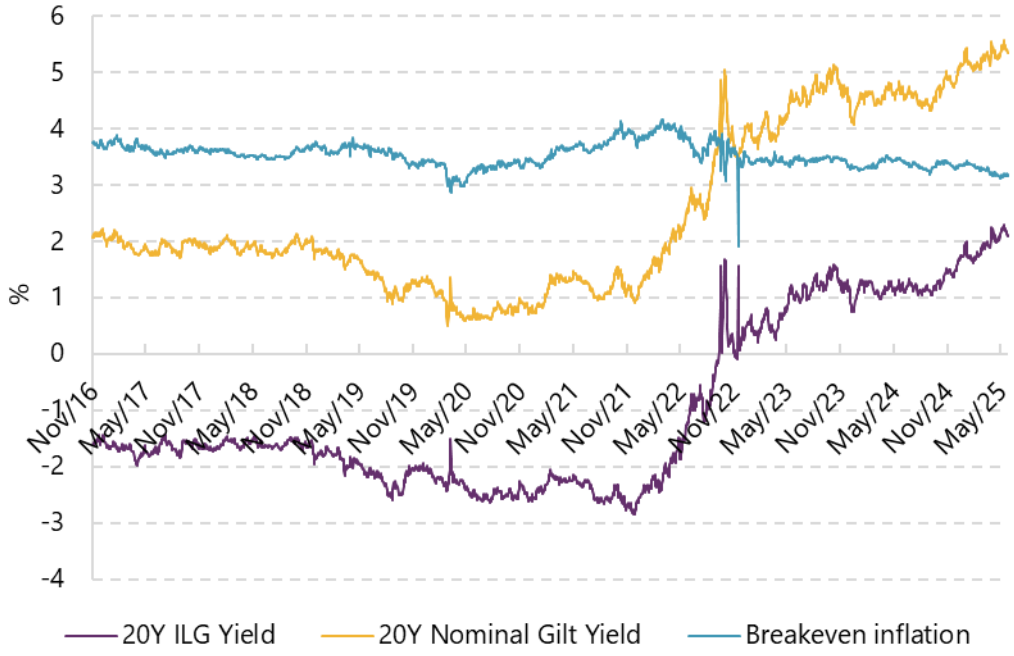
Note: Asset Beta is calculated based on 0.075 debt beta, for both Ofgem SSMD and NERA estimates.
Source: Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, table 18; NERA analysis.

For, RFR we consider ILG yields do not provide a viable estimate for the RFR, given structural excess demand and evidence from break-even inflation. In the DD, Ofgem has confirmed that it will set the RFR for each year of the price control based on the one-month average of the 20-year ILG yield and not to make any adjustments for the convenience premium.

Ofgem fails to adequately address the issue that excess structural demand means that RPI ILD yields are understated, as is clear from breakeven inflation data and supported by a wide range of literature and empirical evidence. For example, our updated evidence of break-even inflation, the difference between nominal gilts less RPI ILD, shows that break-even inflation is around 1 per cent higher than long-run estimates of RPI, even taking into account OBR's 2024 publication around the expected long-term wedge of 0.4 per cent.

We show that any reasonable measure of the inflation risk premium, and CMA and Ofgem has previously assumed values of between 15 and 30 bps, does not bridge the gap between the ILG and the nominal yield at RIIO-3 – and that this constitutes up-to-date market evidence that ILG yields understate the true RFR.

Figure 1: 20Y Breakeven inflation remains implausibly high at 3.3 per cent relative to long-term inflation expectations of 2.2-2.6 per cent



Source: NERA analysis of Bank of England data.

Ofgem also dismisses evidence on the convenience yield embedded in government debt yields which also means RPI ILG will understate the RFR. Ofgem's principal reason for not making an adjustment for the convenience premium is that the lack of academic evidence on the size of the convenience premium *for ILG at the 10 to 20 year investment horizon*.

This evidential standard leads Ofgem to wrongly dismiss the wide-ranging evidence across different markets and different tenors. However, there is no conceptual reason why the convenience premium would exist across a range of tenors and markets, as the evidence demonstrates, and not be prevalent in 20-year gilt market.

Overall, we estimate a risk free rate based on nominal gilts less forecast of CPI of 2.73 to 3.13 per cent relative to Ofgem's estimate of 2.01 per cent.

For the TMR, Ofgem in part relies on ex ante TMR which in informing its range of 6.8-6.9 per cent. We rely on ex post TMR of 7 per cent.

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 p.a. 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.

Otherwise, for the historical ex post analysis, Ofgem's 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. We calculate an ex post TMR of 7 per cent relative to Ofgem's 6.9 per cent.

For beta, Ofgem should rely principally on European beta evidence which, when combined with a modest uplift for capex:RCV risk, implies a range of 0.40 to 0.45

Ofgem concludes on an asset beta range of 0.30 - 0.45 and determines a point estimate equal to the mid-point of 0.375. Ofgem's range is informed by three sets of comparators: 1) UK water companies – namely, Severn Trent (SVT), United Utilities (UU), and Pennon (PNN); 2) National Grid plc (NG), and 3) a group of four comparator European energy utilities for which there are 10-year beta estimates (Enagas, SNAM, Red Electrica, Terna).

Our principal concerns are that Ofgem should interpret NG's beta evidence with caution, given that its UK regulated activity constitutes around only 40 per cent of its enterprise value and its US operations tend to be lower risk. Ofgem should also not rely on water sector beta evidence, which is of limited relevance to the electricity TOs.

Instead, we consider that Ofgem should place greater weight on European T&D beta comparator, which are the only pure-play networks operating under incentive regulation. We also consider that Hera should be included within its comparator set, as per the approach of many European regulators, but note that its inclusion/ exclusion does not materially change the results.

We also consider that capex:RCV constitutes a beta risk and therefore 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.

Placing less weight on UK regulated assets and more on EU comparators supports a beta estimate in the range of around 0.4 to 0.45.

2. Risk-Free Rate

2.1. Summary of Ofgem DD

In the DD, Ofgem has confirmed that it will set the RFR for each year of the price control based on the one-month average of the 20-year ILG yield and not to make any adjustments for the convenience premium.[1]

Ofgem acknowledges the existence of convenience premium in the shorter term with money like features as the main driver, but states that there are no empirical estimates of the convenience yield for ILGs at longer term horizon (10-20 year).[2]

To convert the RPI ILG to a CPI measure (or the "inflation wedge"), Ofgem will estimate the average wedge based on CPI (as a proxy for CPIH) and RPI medium term forecasts from OBR. However, it notes that the OBR has recently assumed a long run wedge between CPIH and CPI of 0.4 per cent and Ofgem will consider if an adjustment to its inflation assumption and wedge is warranted.[3]

2.2. Our Key Concerns with Ofgem's Approach

Ofgem fails to adequately address the issue that excess structural demand means that RPI ILD yields are understated, as is clear from breakeven inflation data and supported by a wide range of literature and empirical evidence. Ofgem also dismisses evidence on the convenience yield embedded government debt yields which also means RPI ILG will understate the RFR.

Overall, we estimate a risk free rate based on nominal gilts less forecast of CPI of 2.73 to 3.13 per cent relative to Ofgem's estimate of 2.01 per cent.

2.2.1. Excess structural demand means RPI ILD yield understated

In our earlier report, we set out evidence on break even inflation (defined as the difference between nominal yields and RPI ILG), and showed that this was implausibly high relative to any reasonable measure of inflation. We provided evidence that structural excess demand led to the suppression of RPI ILG and that the yields understated the true RFR.[4]

Figure 2.1 provides an updated time-series for both 20Y ILG and nominal yields over the period since 2016, and breakeven inflation over the 20-year tenor of the bonds.

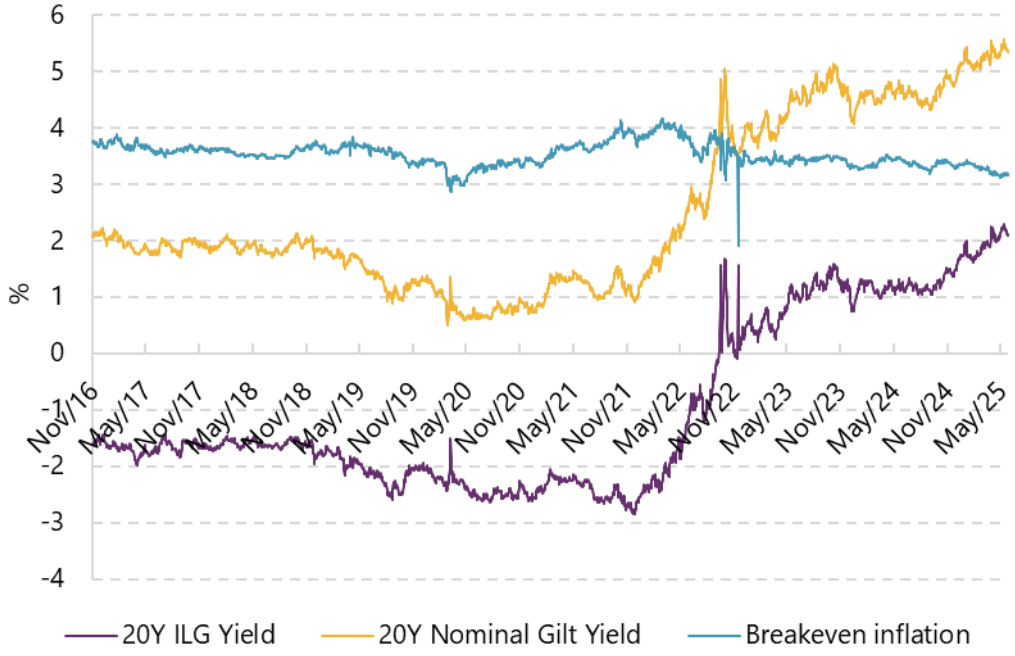
1 Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, p.46

2 Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 45

3 Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, para 3.17.

4 NERA (14 November 2024) Cost of Equity for RIIO-T3, section 3.3

Figure 2.1: 20Y Breakeven inflation remains implausibly high at 3.3 per cent relative to long-term inflation expectations of 2.2-2.6 per cent



Source: NERA analysis of Bank of England data.

As can be seen in Figure 2.1 above, 20-year breakeven inflation has persistently remained between 3 and 4 per cent over the period since 2016, and remains at around 3.3 per cent over the past year.

For comparison of the break-even inflation to market measures, Table 2.1 sets out our updated short-term inflation forecasts from HM Treasury and OBR. C. We combined these short-term forecasts with a longer term forecast for RPI based on: i) 2 per cent Bank of England monetary target and assuming CPIH equals CPI consistent with long-run historical data;[5] and ii) 2.4 per cent, which is OBR's recent view of longer term CPIH-CPI wedge (and therefore RPI-CPI wedge).[6] Overall, we estimate a market-based 20Y RPI of between 2.2 per cent and 2.6 per cent, as per Table 2.1 .

[5] CPI / CPIH: The historical average wedge is around 0.06 per cent from 1990 to 2020.

[6] The OBR document provides a forecast of LR CPI-CPIH wedge based on the additional costs included in CPIH (council tax and owner occupier housing costs) concluding that the expected CPIH LR inflation (and hence RPI) would be around 2.4%, i.e. implied 0.4% wedge to CPI. However, it notes this depends largely on assumptions on average nominal earnings growth in the long-run, which in turn depends on forecasts for productivity growth and GDP deflator. Source: OBR (2024) The long-run difference between RPI and CPI inflation. Link: https://obr.uk/box/the-long-run-difference-between-rpi-and-cpi-inflation/

Overall, consistent with our earlier report, breakeven inflation at around 3.3 per cent is implausibly high compared to a market based forecast for RPI over 20-years of around 2.2 to 2.6 per cent as per Table 2.1.

Table 2.1: Forecasts from HMT and OBR support 20-year RPI inflation of ca 2 per cent – far below 20Y BE of 3.5 per cent

	2026	2027	2028	2029	2031+	Implied 20-year RPI
HMT (May 2025)	3.6	3.5	3.5	3.1	2.0 – 2.4%	2.3-2.6%
OBR (Mar 2025)	3.2	3.0	2.9	2.8	2.0- 2.4%	2.2-2.5%

Note: As HM Treasury and OBR forecasts do not extend beyond 2029, we calculate the implied 20-year RPI by averaging 19 data points, omitting year 2030 and assuming 2 -2.4 per cent RPI thereafter. Source: HM Treasury (May 2025), Forecasts for the UK economy: a comparison of independent forecasts, p.20; and Office for Budget Responsibility (March 2025), Economic and fiscal outlook – detailed forecast tables: economy, tab "1.7".

2.2.2. An implausibly high BE inflation was not an issue at RIIO-2 appeal

Ofgem rightly characterises our view that the implied break-even inflation rate of around 3.3 per cent, does not make sense when compared to market survey expectations of expectations of closer to 2.1 to 2.6 per cent. Ofgem then goes on to state that at the RIIO-2 appeals the CMA concluded that the difference could be explained in terms of liquidity risk premium and inflation risk premium.[7] However, the CMA did not specifically address the (now implausible) difference between break-even inflation and market measures of inflation at the RIIO-2 appeal. Rather the CMA concluded that any use of nominal gilts as a cross-check on the ILG risk-free rate would also require an adjustment for the inflation risk premium, as per Ofgem's approach, but ultimately concluded that that Ofgem was not wrong to employ nominal gilts as a cross-check.[8]

The market evidence has changed relative to the time of the RIIO-2 appeals. As stated, at RIIO-2 Ofgem employed nominal interest rates less inflation as a cross-check on its RPI ILD estimate for the RFR. Ofgem then concluded that when nominal gilts are adjusted for inflation and an inflation risk premium of 30 bps the resulting estimate for the RFR was close to the ILG method, and the approach provided a valid cross-check on its use of ILG.[9] However, as we show in section 2.3 any reasonable measure of the inflation risk premium does not bridge the gap between the ILG and

7 Ofgem (2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, para. 3.31, p. 50

8 CMA (2021) Final determination, Volume 2A: Joint Grounds: Cost of Equity, para 5.145 https://assets.publishing.service.gov.uk/media/617fe5468fa8f52980d93209/ELMA_Final_Determination_Vol_2A_publication.pdf

9 Ofgem (2021) RIIO-2 Price control: Response to appeals on finance issues and TNUOS, para 94. Although not explicitly stated, we understand that Ofgem adopted an inflation risk premium of 30 bps. Link: https://assets.publishing.service.gov.uk/media/60915540d3bf7f013a9a5560/GEMA_Response_on_Finance_Issues_and_TNUOS_.pdf

the nominal yield at RIIO-3 – and that this constitutes new market evidence that ILG yields understate the true RFR.

2.2.3. Ofgem wrongly dismisses evidence on the mis-pricing of ILG

In our earlier report, we provided a range of market evidence on the mis-pricing of ILG, including a Bank of England Working Paper.[10] Ofgem concludes that this paper itself does not provide compelling evidence of the mispricing of inflation given, for example, the potentially small sample size.[11] However, Ofgem ignores the wider body of evidence – for example, the authors show that the results are consistent with other research and wider empirical evidence, including other UK studies, and conclude that mis-pricing across nominal and RPI ILD is a "widely documented phenomenon".[12,13]

We also provide a wide range of other market based evidence that very high demand for ILG's from insurance and pension funds, who frequently acquire ILGs "*irrespective of their price*", contributes to the mis-pricing of ILG.[14]

2.2.4. Ofgem wrongly rejects wide-ranging evidence on 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 wider evidence on the convenience premium.[15] As per the SSMD, in its DD Ofgem's principal reason for not making an adjustment for the convenience premium is that the lack of academic evidence on the size of the convenience premium *for ILG at the 10 to 20 year investment horizon*.[16]

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10 NERA (14 November 2024) Cost of Equity for RIIO-3, section 3.3.2, p. 16

11 Ofgem (June 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. XX

12 Bank of England (August 2023), Mispricing in inflation markets, p. 1, footnote 1

13 Ofgem also states that to assume a continued mis-pricing between ILGs and nominal gilts implies that there is a persistent arbitrage opportunity and that seems unlikely. However, the Bank of England paper clearly explains why these anomalies persist and cannot be arbitraged away for long-dated tenors but are arbitraged away for short tenors. Bank of England (August 2023), Mispricing in inflation markets, p. 3.

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

15 As discussed in more detail in our earlier report, 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 (such as corporate issuers) who are unable to borrow at the government bond rate. The special characteristics of government bonds – namely their security and liquidity characteristics compared to other securities – gives rise to a convenience premium that needs to be adjusted when drawing on government securities as a proxy for the RFR. See: NERA (14 November 2024) Cost of Equity for SPT at RIIO-3, section 3.3.3

16 Ofgem (18 July 2024), Sector Specific Methodology Decision – Finance Annex, para 3.46. Ofgem (June 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, para 3.34. For example, Ofgem dismissed evidence from a paper by Feldhutter and Lando paper on convenience premium in US market as "it's not clear to us that this paper demonstrates the presence of a convenience yield in 20-yr UK ILGs". Ofgem draws precisely the same

This evidential standard leads Ofgem to wrongly dismiss the wide-ranging evidence across different markets and different tenors. For example, in our earlier paper, we cited a range of academic evidence for convenience yield for UK gilts of around 40 bps, consistent with estimates by the authors for other markets and other studies, although we noted that this evidence focusses on short tenors.[17] We also provided evidence on the convenience premium on longer-dated government bonds (such as the 20-year ILGs it uses to estimate the RFR), albeit from other countries such as the US.[18]

However, there is no conceptual reason why the convenience premium would exist across a range of tenors and markets, as the evidence demonstrates, and not be prevalent in 20-year gilt market. There is wide-ranging empirical research shows that government bonds have special safety and liquidity characteristics compared to other securities which explain the convenience premium. Ofgem has previously stated that "it would seem illogical to use longer-dated instruments, with significantly higher duration risk, for money-like purposes" as one reason for suggesting that the convenience premium may be more prevalent in shorter tenor debt. [19] However, there are a variety of factors that explain a convenience premium, and notably the use of the debt for security and for regulatory purposes, that imply the convenience premium would be as prevalent in longer term tenors.

2.3. Estimating RFR based on nominal gilt yields

As discussed in section 2.2.2 above, the use of nominal gilt yields as the basis for the risk free rate requires the adjustment for an inflation risk premium. 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.[20] At RIIO-2, Ofgem provided evidence that the risk premium was 30 bps, and imposed such an adjustment to show the approximate equivalence of the risk free derived from nominal gilts with ILG.[21]

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conclusion in terms of evidence provided in a Bank of England study (para 3.25) and a paper by Acharya and Laarits (para 3.26).

17 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

18 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.

19 Source: Ofgem (July 2024), 'RIIO-3 Sector Specific Methodology Decision – Finance Annex para. 3.46.

20 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.

21 Ofgem (2021) Decision - RIIO-2 Final Determinations – Finance Annex (REVISED), para 3.19. Ofgem states that an adjustment for nominal gilt yields for the inflation risk premium "would bring it more in line" with the RPI ILG and SONIA swap. The implication is that Ofgem considers an inflation risk premium of around 30 bps.

However, if we make such a downward adjustment for the inflation risk premium, it is also reasonable to make an upward adjustment for the convenience premium. We believe that the existence of the convenience premium, where the evidence supports a premium of around 40 bps,[22] 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.

Table 2.2: Real Risk-Free Rate for RIIO-3 Based on Nominal Gilts

Component	Value	
Nominal gilt yields (Mar 2025)	5.26%	5.26%
- Long-term CPIH forecast	2.06%	2. 46%
Nominal gilt yields (adjusted for CPIH)	3.13%	2.73%
CPI-real RFR based on Ofgem approach	2.01%	2.01%
Difference to RFR based on Ofgem approach	**1.11%**	**0.71%**

Note: we deflate for long term CPIH forecasts using the Fisher equation. All calculations are based on financial market data as of March 2025. Source: NERA analysis.

In addition, at RIIO-2 appeals, Ofgem stated that once nominal gilts are adjusted for inflation risk premium, they produce a very similar RFR to ILGs.[23] At RIIO-3, it is clear from the above Table that any reasonable estimate of the inflation risk premium (and as noted above Ofgem assumed 30 bps at RIIO-2) would not bridge the gap of between 71 and 111 bps between nominal and ILG yields, and that ILG is mis-priced. This new evidence, of greater materiality than at RIIO-3 constitutes a "good reason", as Ofgem defines the term, to depart from UKRN Guidance and Ofgem's RIIO-2 approach.[24]

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 above, we provide evidence that RPI ILG yields are depressed, and adding a convenience premium does not address that fundamental problem with RPI ILG.

22 See section 2.2.4

23 Ofgem (2021) RIIO-2 Price Control: Response to Appeals on Finance Issues and TNUoS, para 94. Link: https://assets.publishing.service.gov.uk/media/60915540d3bf7f013a9a5560/GEMA_Response_on_Finance_Issues_and_TNUOS_.pdf

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

3. Total Market Return (TMR)

3.1. Summary of Ofgem DD

As per its SSMD, Ofgem estimates the TMR via an assessment of long-run historical returns, drawing on both historical ex post and historical ex ante analysis. Ofgem deflates historical returns using a combination of the Consumption Expenditure Deflator (CED) (1900 -1947), ONS's CPIH backcast (1950 - 1988) and ONS actual CPIH datasets.[25]

Regarding the historical ex post analysis, Ofgem estimates the ex post TMR to be 6.92 per cent, based on the arithmetic average of annual returns over the entire dataset.[26]

For the ex post methodology, Ofgem employs DMS decompositional approach, which adds the historical average of dividend growth to the historical average of the dividend yield. Correcting for elements of its approach at SSMD, Ofgem now estimates an historical ex ante TMR of 6.79 per cent relative to 6.5 per cent at SSMD.[27]

3.2. Our Key Concerns with Ofgem's Approach

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 our earlier report.[28] However, Ofgem reports an historical TMR of 6.92 per cent relative to our calculation of 6.96 per cent. It is not clear to us the basis for this difference.

For the ex ante historical TMR, Ofgem's has corrected for a number of errors in its estimate of the ex ante historical TMR using DMS data at SSMD. Although Ofgem has corrected its approach, its estimate of 6.79 per cent lies below our estimate of 6.86 per cent. More fundamentally, we find no reason to rely on historical ex ante methods in the absence of unexpected capital gains (or price-earnings expansion), as we explain below.

3.2.1. There is practically 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.[29] Fama and French explain that the DGM excludes that element of historical returns that relate to an apparent decline in discount rates

25 Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, p.51

26 Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, para 3.41. p. 53

27 Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, paras 3.78 & 3.79

28 NERA (14 November 2024) Cost of Equity for RIIO-T3, section 4.3

29 Fama & French (April 2002), The Equity Premium, The Journal of Finance.

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.[30]

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.

3.2.2. Ex ante TMR should approximately equal 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 3.1, we show the close equivalence of our historical ex ante TMR of 6.86 per cent to the historical ex post of 6.96 per cent, and the close equivalence of Ofgem's ex ante 6.79 per cent to its ex post (6.92 per cent).

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

Table 3.1: NERA Calculation of Ex Ante TMR compared to Ofgem Draft Determination

		Ofgem DD	NERA	Note
A	Geometric mean dividend yield	4.55%	4.55%	
B	Growth rate of real dividends	0.64%	0.74%	*We understand Ofgem has converted DMS series from COLI/CPI real whereas we convert at step F*
C=A+B	Geometric mean TMR	5.19%	5.32%	*We use geometric summation as per DMS, instead of Ofgem's arithmetic summation*
D	GM-AM conversion	1.61%	1.69%	*We both calculate conversion based on half variance of DMS real return but note that this is an approximation*
E=C+D	Raw arithmetic TMR	6.79%	7.01%	
F	COLI-CED adjustment	n/a	-0.15%	*We adjust for the difference between AM TMR based on COLI-CPI (DMS inflation) and CED+CPIH. Ofgem adjusted at step B*
G=E+F	Raw arithmetic 'ex ante' TMR	n/a	6.86%	
H	Serial correlation adjustment	n/a	n/a	*We agree no basis for serial correlation adjustment*
I=G+H	Arithmetic ex ante TMR estimate	**6.79%**	**6.86%**	
	Comparison with historical ex post	**6.92%**	**6.96%**	

Source: NERA analysis

As shown above, our respective estimates of the historical ex ante and ex post are very close. 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.

3.3. Conclusions

For the historical ex post analysis, Ofgem's 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.

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 p.a. 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.[31] To the extent that the TMR varies positively with the RFR, our approach understates the TMR during a period of relatively higher interest rates, as per RIIO-3.

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

4. Beta

4.1. Summary of Ofgem DD

In its DD, Ofgem states that it will calculate the beta using the methodology in the SSMD – i.e. it will base the beta analysis on OLS regressions of relevant listed comparators; it will de-gear these to assess unlevered asset betas, combine these estimates with a debt beta assumption of 0.075 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.[32]

Ofgem presents a beta range considering data across 2, 5 and 10-year timeframes, but states that that is has a preference to rely on longer-term (10-year) timeframes to avoid distortions created by high market volatility.[33]

Ofgem proposes to draw on three sets of comparators in its analysis: 1) UK water companies – namely, Severn Trent (SVT), United Utilities (UU), and Pennon (PNN); 2) National Grid plc (NG), and a group of four comparator European energy utilities for which there are 10-year beta estimates (Enagas, SNAM, Red Electrica, Terna), plus Ofgem reports Italgas beta for the shorter 2 and 5-year periods.[34]

Ofgem considers that it should retain water companies in the set "*in the absence of pure play GB energy network comparators.*"[35] Ofgem also considers that it should retain NG within the sample set, despite its substantive US network activities which it does not agree are lower risk. It also notes that NG has increased its exposure to UK assets with its acquisition of WPD in 2021.[36]

Ofgem also does not consider that it should adjust ET beta for higher capital expenditure anticipated at ET3 because these risks are non-systematic and otherwise accounted for in the ET3 package, e.g. through ASTI.[37]

Ofgem concludes on an asset beta range of 0.30 - 0.45 and determines a point estimate equal to the mid-point of 0.45.

4.2. Our Key Concerns with Ofgem's Approach

Our principal concerns are that Ofgem should interpret NG's beta evidence with caution, given that its UK regulated activity constitutes around only 40 per cent of its enterprise value and its US

32 Ofgem (1 July) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 55

33 Ofgem (1 July) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 55. para 3.54

34 Ofgem (1 July) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 55, para 3.55

35 Ofgem (1 July) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 55, para 3.56

36 Ofgem (1 July) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 55, para 3.57

37 Ofgem (1 July) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 55, para 3.63

operations tend to be lower risk. Ofgem should also not rely on water sector beta evidence, which is of limited relevance to the electricity TOs.

Instead, we consider that Ofgem should place greater weight on European T&D beta comparator, which are the only pure-play networks operating under incentive regulation.

We also consider that capex:RCV constitutes a beta risk and therefore 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.

Placing less weight on UK regulated assets and more on EU comparators supports a beta estimate in the range of around 0.4 to 0.45.

4.2.1. Ofgem should place less weight on NG and UK Water

NG is a problematic comparator for UK networks, as UK regulated activity constitutes a minority of its overall operations. Ofgem states that GB regulated networks accounted for 68% of post exceptional operating profits accounts for the year ended Mar 2024.[38] However, Ofgem is wrong to draw solely on a share of operating profits. NG's composite beta (i.e. the NG plc's group asset beta) is a weighted average of the betas associated with its different businesses (i.e. comprising UK and US asset betas), where the weights are given the by relative weight of asset values. [39] Therefore, the relevant measure is NG's UK regulated assets as a percentage of NG's enterprise value (EV).

Updating the analysis in our earlier report, we show that equity analyst reports between 2017 and 2025 are generally aligned in attributing the majority of National Grid's EV 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 EV (based on analyst estimates) ranges from 35.6 per cent to 48.5 per cent over the 2017-2025 period, as set out in Table 4.1 below.

Ofgem is wrong to rely on a share of operating profit, and also wrong to conclude that NG's acquisition of WPD implies greater focus on UK assets. The data shows that UK assets have a weighting of far less than a half in the overall NG composite beta, including the period post WPD acquisition.

[38] Ofgem (2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 56, footnote 27

[39] NG's composite beta (i.e. the NG plc's group asset beta) is a weighted average of the betas associated with its different businesses (i.e. comprising UK and US asset betas), where the weights are given the by relative weight of asset values, as illustrated in the following equation:

$$\beta_{NG} = \frac{Regulated\ assets\ in\ UK}{Total\ regulated\ assets} * \boldsymbol{\beta_{UK}} + \frac{Regulated\ assets\ in\ US}{Total\ regulated\ assets} * \beta_{US}$$

Table 4.1: 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%
2025	43%

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 provide evidence that 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.[40]

4.2.2. Ofgem is incorrect to include UK water sector comparators

In determining its range, Ofgem relies on UK water sector beta evidence, including Pennon, United Utilities and Severn Trent.

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, as set out in our earlier report.[41]

Foremost of these risks, 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.[42] The Table below compares the capex to RAV ratios of SPT and UK water companies at the most recent price controls. As shown in Table 4.2, SPT has higher capex to RAV ratios than water companies at RIIO-2, implying greater relative capex size and higher investment risks for SPT compared to water networks.

40 NERA (24 July 2025), US Allowed Cost of Equity vs Ofgem DD, Section 2.

41 NERA (14 November 2024), The Cost of Equity at RIIO-T3, p. 37.

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

Table 4.2: SPT faces higher capex risk than UK GD and Water

	SPT			Water		
Capex/opening RAV	RIIO-1	RIIO-2	RIIO-3	PR14	PR19	PR24
	15%	9-19%	29%	6-8%	6-7%	5-6%

Note: For SPT, the RIIO-2 range is based on baseline totex (lower bound) and totex under the Net Zero scenario (upper bound), while RIIO-3 is based on the totex ranges set by Ofgem at the draft determinations and based on SPT business plan financial model (BPFM). 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).
Source: NERA-analysis of Ofwat 2024 DD.

This is supported by the empirical evidence which shows higher beta risk for energy network comparators relative to water, as demonstrated by Ofgem's own beta analysis which shows water betas at the lower end of its beta range of 0.30 to 0.45 over Ofgem's preferred longer timeframes.[43]

4.2.3. Ofgem should place greater weight on European Utility Comparator Set, including Hera

Ofgem reports a set of 5 European network comparators, comprising Red Electrica Corporacion (Spain), Terna (Italy), Snam (Italy), Enagas (Spain) and Italgas (Italy), although Italgas beta estimates are only available for the shorter 2 and 5-year period. The key advantage of European networks is that they provide the only source of relevant "pure-play" listed electricity and gas network comparators subject to incentive based regimes.

In addition to the comparator set employed by Ofgem, we proposed to include Hera. We 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. We concluded that Hera is a relevant comparator to add to the European comparator set, alongside the five comparators already identified by Ofgem, as its regulated activities constitute more than 50 per cent of its activities. For example, we calculate that around 60 per cent Hera's EBITDA is related to regulated activities, including gas distribution, electricity distribution, water and waste collection services.[44] By contrast, Ofgem has excluded Hera on the basis that less than 50 per cent of revenues are related to energy networks.[45]

[43] For example, UU and SVT have the lowest two beta values for both 5 and 10-year estimation periods in Ofgem's sample of 9 comparators. See Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, p. 56, Table 16

[44] 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.

[45] Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, para. 3.60

We acknowledge that the inclusion of Hera as a comparator is marginal, depending on whether we focus solely on proportion of regulated energy assets in its asset baes or also consider other utility assets. In support of its inclusion, we note that Hera is included as a relevant comparator by a wide range of European regulators, including regulators in Spain (all sectors), France (GT-GD), Austria (GT), Belgium (ED-GD).[46]

Based on a revised comparator set consisting of i) the comparators used by Ofgem 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 0.40-0.42, based on Ofgem's preferred 10-year estimation period, drawing on spot, 2 and 5-year averaging periods. However, we also show beta estimates excluding Hera, noting that it is a multi-utility regulated business. However, the beta range declines only marginally to 0.39 to 0.43 for 10-year estimation windows.

As set out in our earlier report, we also believe that Ofgem is wrong to focus only on spot estimates, as these can be volatile, and that we should also draw on longer averaging periods as per common regulatory practice.[47]

Table 4.3 below sets out the individual and summary statistics.

[46] Spain: CNMC, (12 November 2019), CIR/DE/011/19, p.37; France (We note that Hera is considered in the comparator pool selected by Compass Lexecon, the consultant of French Energy Regulatory Commission (CRE). However, the range identified by Compass Lexecon were not used by CRE as they would represent a "departure from the methods and parameters used to date by CRE"): CRE (30 January 2024), Délibération de la Commission de régulation de l'énergie du 30 janvier 2024 portant décision sur le tarif d'utilisation des réseaux de transport de gaz naturel de GRTgaz et Teréga, p.54; CRE (July 2023) Public Consultation No. 2023-07 Of 26 July 2023 relating to next tariff for the use of natural gas transmission networks of GRTgaz and Teréga, p.60; Compass Lexecon (38 July 2023), Estimation du CMPC des activités régulées de distribution de gaz pour la période 2024-2028 p. 36; CRE (15 February 2024), Deliberation of 15 February 2024 concerning the decision on GRDF's regulated tariff for use of the public natural gas distribution networks, p.57; Austria: E-Control (n.d.), METHODE GEM § 82 GWG 2011 DER 4. PERIODE FÜR DIE FERNLEITUNGEN DER XXX GMBH, p. 7; E-Control (n.d.), Methode gem § 82 GWG 2011 der 5. Periode für die Fernleitungen der xy GmbH, p.9; Randl, Zechner (3 November 2019), Gutachten zur Ermittlung von angemessenen Finanzierungskosten für Gas Fernleitungsbetreiber für die Regulierungsperiode 2021 bis 2024, p.34; Belgium: CWaPE (31 May 2023), Annexe 1 - Motivation de la méthodologie tarifaire applicable aux gestionnaires de réseau de distribution d'électricité et de gaz actifs en région wallonne pour la période régulatoire 2025-2029, pp.32-33.

[47] CMA (28 October 2021), Final determination: Volume 2A: Joined Grounds: Cost of equity, paras 5.518-5.520; CMA (17 March 2021), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations– Final report, paras 9.473 & 9.479.

Table 4.3: European Comparator Asset Betas by Estimation Window and Averaging Period (information cut-off, 31 March 2025)

		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	0.25	0.31	0.30	0.35	0.25	0.31	0.33	0.38	0.33	0.35	0.37
Terna	Elec	0.26	0.40	0.42	0.44	0.37	0.44	0.45	0.44	0.43	0.45	0.44
Snam	Gas	0.29	0.41	0.44	0.46	0.38	0.46	0.48	0.46	0.44	0.46	0.46
Enagas	Gas	0.29	0.30	0.34	0.37	0.29	0.36	0.38	0.40	0.36	0.38	0.40
Italgas	Gas	0.29	0.38	0.39		0.34	0.39					
Hera	Multi	0.46	0.54	0.54	0.45	0.50	0.52	0.50	0.44	0.45	0.45	0.43
Average		**0.31**	**0.39**	**0.41**	**0.41**	**0.36**	**0.41**	**0.43**	**0.42**	**0.40**	**0.42**	**0.42**
Average (exc Hera)		**0.28**	**0.36**	**0.38**	**0.40**	**0.33**	**0.39**	**0.41**	**0.42**	**0.39**	**0.41**	**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 31 March 2025; 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.

4.2.4. Impact of Capex risks

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 for the set of EU comparators.

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

SPT (along with other TOs) anticipates unprecedented levels of investment over the next price control. Ofgem has set out in its DD 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 4.2 above.

Regulators have previously accepted that an uplift to cost of equity via beta is justified due to large capital programmes. For example, in our previous report, we noted that Ofgem, the Utility Regulator, and CMA have all made adjustments to betas for capex risk.[48] Rating agencies also examine capex to RAV as a measure of credit risk.[49]

The challenge here is to make a mechanistic adjustment for capex risk to necessarily backward looking beta evidence. As we set out in our earlier report, the adjustments by UK regulators in

[48] NERA (14 November 2024) Cost of Equity for RIIO-T3 p.40

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

recent reviews vary substantively: from around 0.02 to around 0.2.[50] However, overall, the evidence demonstrates that higher capex:RCV increases beta risk and substantively so.

4.3. Conclusions

Above in this section we set out the following comments on Ofgem's DD 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.
- Ofgem should not rely on water sector beta evidence, which is of limited relevance to the UK gas and electricity sectors;
- Ofgem should principally determine beta based on European T&D beta comparator set as the only pure-play energy networks.
- 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 0.40-0.42, and we conclude a reasonable range of 0.40 to 0.45 allowing for a modest uplift for capex risk, consistent with the *minimum* uplift for recent UK regulatory decisions of between 0.02 and up to 0.2.

[50] For example, Ofgem's consultants estimated an asset beta difference of between 0.45 and 0.65 to apply to the construction phase for Hinkley Seabank. See NERA (14 November 2024) Cost of Equity for RIIO-T3 p.40.

5. Conclusions on CAPM Cost of Equity

Table 5.1 summarises Ofgem's DD cost of equity compared to our estimate. Overall, we estimate a range of 6.13 to 6.65 per cent which lies substantively above Ofgem's cost of equity range of 4.76-6.45 per cent.

Table 5.1: Ofgem's DD Cost of Equity Range of 4.76-6.45 per cent lies substantively below NERA's Range of 6.13-6.65 per cent (@55 per cent gearing)

	Ofgem DD			NERA estimate		
	Low	**High**	**Proposed**	**Low**	**High**	**Comment**
[A] Gearing	55%	55%	55%	55%	55%	
[B] Risk-Free Rate	2.01%	2.01%	2.01%	2.73%	3.13%	Ofgem: based on ILG NERA: based on nominal gilts
[C] TMR	6.8%	6.9%	6.9%	7.0%	7.0%	Ofgem: ex post and ex ante NERA: ex post
[D] Asset Beta (debt beta 0.075)	0.30	0.45	0.375	0.40	0.45	Ofgem: GB and EU comparators NERA: EU comparators
[E] Equity beta	0.58	0.91	0.74	0.80	0.91	Calc.
[F] Cost of Equity	4.76%	6.45%	5.64%	6.13%	6.65%	**[B] + [E] * ([C] - [B])**

Note: Asset Beta is calculated based on 0.075 debt beta, for both Ofgem SSMD and NERA estimates.
Source: Ofgem (1 July 2025) Consultation - RIIO-3 Draft Determinations - Finance Annex, table 18; NERA analysis.

In summary, for, RFR we consider ILG yields do not provide a viable estimate for the RFR, given structural excess demand and evidence from break-even inflation. Instead, the use of nominal gilt instruments provides the most viable approach to estimating the RFR.

For the TMR, Ofgem relies on ex ante TMR but evidence from DMS shows that the ex ante TMR should approximate to the ex post TMR, in the absence of historical price-earnings expansion or "good luck". We calculate an ex post TMR of 7 per cent.

For beta, we consider that Ofgem should rely principally on European beta evidence, when combined with a modest uplift for capex:RCV risk, implies a range of 0.40 to 0.45. By contrast, Ofgem range in part draws on UK water and energy evidence which is unreliable.

NERA

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