Response to Ofgem's minded-to WACC position for the Hinkley-Seabank project

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Executive summary

In its consultation on the delivery model for the Hinkley-Seabank (HSB) project,[1] Ofgem has laid out its minded-to position for the forward-looking weighted average cost of capital (WACC) for the construction and operational phases. In light of this consultation document, National Grid Electricity Transmission (NGET) has instructed Oxera to review Ofgem's proposals (informed by analysis conducted by CEPA).

Oxera's review finds that there is a paradox in the Competition Proxy model, because the model is intended to set returns at the level required to incentivise investment in a stand-alone project with its own licence, while the very existence of the Competition Proxy model is due to the fact that the HSB project cannot have its own licence. The implication is that the return required under the Competition Proxy model will be higher than that estimated by CEPA for a stand-alone project.

Notwithstanding the paradox of applying the Competition Proxy model to a project that will not have its own licence, we understand that CEPA has attempted to estimate the cost of capital as if HSB were a stand-alone project. However, the analytical framework that has been applied has several inconsistencies and omissions, as follows.

1. The cost of capital does not appear to have been consistently developed on the basis of a stand-alone project without recourse to the resources of a parent company—i.e. in places, the analysis appears to implicitly assume that financing costs will be lower than in a stand-alone project because the project will be part of a portfolio of projects, and therefore have recourse to other projects' cash flows.

2. The risk premium on unlevered equity is lower than the risk premium on debt in the operational phase, which is inconsistent with the relative priorities of claims in the event of distress or default. The risk premium on equity must be larger than the risk premium on the debt of the same company, because debt has a more senior claim than equity on the company's cash flows and assets.

3. The analytical framework does not provide a premium over the company's cost of capital to reflect the pricing of project-specific risks that would arise during a competitive process. As a result, the expected return is likely to be lower than the investment's cost of capital over the life of the project.

4. The current regulatory proposals lack clarity in a number of important areas, which results in an inefficient allocation of risk and an increase in the cost of capital, as investors face the residual uncertainty when regulatory aspects of the regime are unclear.

The inconsistencies in CEPA's analytical framework render the resulting WACC estimates unreliable for use in the Competition Proxy model. The arguments and analysis presented in this review report highlight the importance of Ofgem reconsidering the appropriateness of the methodology and estimates of its minded-to WACC position.

[1] Ofgem (2018), 'Hinkley-Seabank project: minded-to consultation on delivery model', 23 January. Hereafter referred to as Ofgem (2018).

In particular, the methodology to estimate the construction phase WACC is unreliable for the following reasons.

1. CEPA's estimate of the cost of debt (based on investment grade rated corporate bond indices) does not take sufficient account of the fact that the debt financing would be non-recourse to the cash flows and assets of other projects, leading to a higher risk and a higher cost of debt.
2. The underlying assumption that HSB would achieve an investment grade credit rating in the construction phase is inconsistent with the level of cash flow and interest coverage that the project would have in the construction phase.
3. CEPA's estimate for the total market return (TMR) appears unrealistic and does not reflect a balanced view of the available evidence. It also does not take account of an important literature that shows a negative relationship between the equity risk premium (ERP) and the risk-free rate (RfR).
4. The companies adopted by CEPA to benchmark the project beta and gearing do not accurately reflect the risks associated with HSB.

For the operational phase, there are three main inconsistencies in the analysis.

1. The WACC estimate implies that the risk premium on the asset is below the risk premium on (lower-risk) debt instruments. This cannot be correct—the risk premium on unlevered equity must be higher than the risk premium on debt of the same company, since the latter stands in higher priority in the event of distress or default.
2. CEPA's interpretation of OFTO benchmarks is inconsistent with its own explanation relating to regulatory regime risk.
3. The estimated level of gearing is inconsistent with the estimate of the cost of debt.

These weaknesses and inconsistencies in the WACC estimation methodology have resulted in WACC estimates that are too low in both the construction and operational phases. The estimates advanced in the minded-to consultation therefore cannot be relied upon.

1 Introduction

In its consultation on the delivery model for the HSB project,[2] Ofgem has laid out its minded-to position for the forward-looking WACC for the construction and operational phases. The methodology and estimates imply significant reductions to the allowed WACC since Ofgem's last review in 2012 in the context of National Grid's transmission assets.[3] This is shown in the table below.

Table 1.1 Comparison of Ofgem's current WACC proposals

	Time period covered by regulatory allowance (years)	RPI-deflated vanilla WACC
RIIO-T1 (NGET)[1]	8	4.02%
RIIO-ED1[2]	8	3.43%
Hinkley-Seabank (construction phase)	5	1.12–2.70%
Hinkley-Seabank (operational phase)	25	0.60–1.75%
Hinkley-Seabank (lifetime WACC)[3]	30	0.71-1.93%

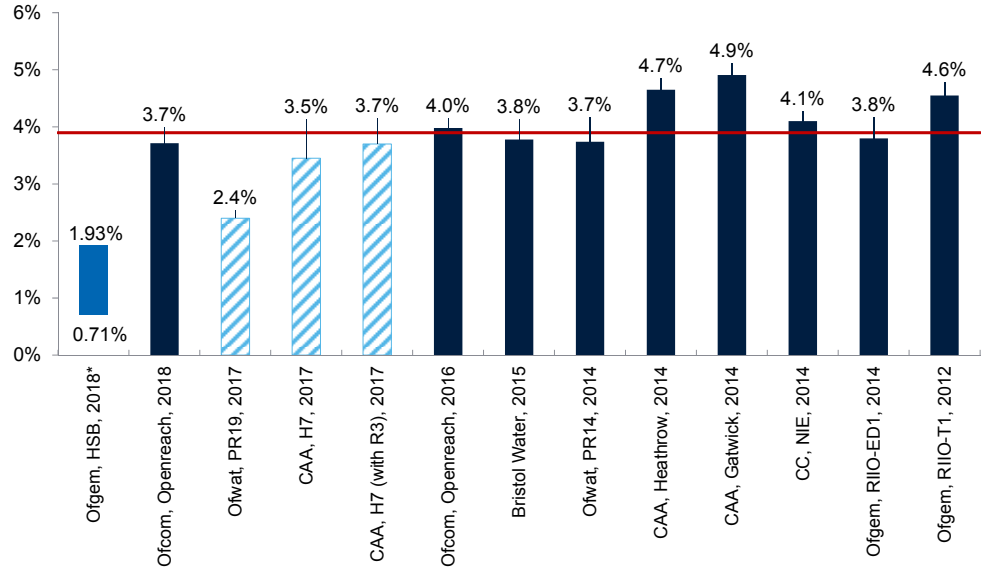
Note: [1] The real vanilla WACC has been updated for 2018/19 based on the cost of debt indexation methodology. The real vanilla WACC set in 2013/14 was 4.55%. [2] Similarly, the real vanilla WACC has been updated for 2018/19 based on the cost of debt indexation methodology. The real vanilla WACC set in 2015/16 was 3.8%. [3] As calculated by Oxera based on estimates presented by Ofgem. A lifetime WACC is calculated assuming constant annual CAPEX and hence constant regulatory asset base (RAB) accumulation during the construction phase, and amortisation of the RAB in RPI-deflated terms to achieve a constant RPI-deflated revenue stream during the operations phase.

Source: Ofgem (2012), 'RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas'; Ofgem (2017), 'Cost of Debt Indexation AIP 2017'; CEPA (2018), 'Review of cost of capital ranges for new assets for Ofgem's Networks Division'.

The proposed allowed rate of return sets a new lower bound (in real vanilla terms) among the prevailing determinations of all the other economic regulators in the UK—see Figure 1.1 below.[4]

[2] Ofgem (2018).
[3] Ofgem (2012), 'RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas', 17 December.
[4] As the real vanilla WACC ignores inflation and tax considerations, it presents a suitable metric for comparing the regulatory determinations of the WACC across sectors. We also note that, whereas regulators have consistently set allowed returns for utilities above the UK government's social time preference rate (3.5%)—the rate at which the government discounts publicly funded projects—Ofgem's current minded-to position is less than half of the benchmark rate of return adopted by the UK government.

Figure 1.1 Real vanilla WACC allowances by UK regulators



Note: The red line represents the average of real vanilla WACC allowances excluding that for HSB. Where regulators do not publish real vanilla WACC determinations, Oxera has estimated these. The determinations above are set out in reverse chronological order. The striated bars indicate consultation proposals. The consultation proposals for the Civil Aviation Authority in 2017 indicate the mid-point of the CAA's range. R3 relates to runway 3 at Heathrow Airport.
* The bar for HSB indicates the range for HSB's lifetime WACC based on Ofgem's minded-to position. RIIO-T1's reported WACC is the WACC for NGET; the WACC for National Grid Gas Transmission was 4.4%.

Source: Oxera analysis based on Ofcom (2018), 'Wholesale Local Access Market Review: Draft Statement', February, Annex 20; Ofwat (2017), 'Delivering Water 2020: Our final methodology for the 2019 price review', December, Appendix 12; Civil Aviation Authority (2017), 'Economic regulation of capacity expansion at Heathrow: policy update and consultation', December, p. 78; Ofcom (2016), 'Business Connectivity Market Review', April, Annex 30; Competition and Markets Authority (2015), 'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991', October, p. 335; Ofwat (2014), 'Setting price controls for 2015-20. Final price control determination notice: policy chapter A7 – risk and reward', December, pp. 41–42; Civil Aviation Authority (2014), 'Estimating the cost of capital: a technical appendix for the economic regulation of Heathrow and Gatwick from April 2014: Notices of the proposed licences – CAP 1140', p. 52; Competition Commission (2014), 'Northern Ireland Electricity Limited price determination – Final determination', March, pp. 13–39; Ofgem (2014), 'RIIO-ED1: Final determinations for the slow-track electricity distribution companies - Overview', November, p. 40; Ofgem (2012), 'RIIO-T1: Initial proposals for National Grid Electricity Transmission plc and National Grid Gas plc', July, p. 24.

In light of this, NGET has asked Oxera to review Ofgem's proposals for estimating the WACC parameters and the resulting allowed rate of return.

This report presents Oxera's review of Ofgem's proposals for the WACC for HSB. It is structured as follows.

- Section 2 discusses the economic principles underpinning the proposed Competition Proxy model.
- Section 3 provides a critique of CEPA's (Ofgem's adviser) methodology to estimate the project WACC of HSB.
- Sections 4 and 5 present Oxera's review of CEPA's proposals for the WACCs for the construction and operational phases, respectively.

2 The economics of the Competition Proxy model

There is a paradox in the Competition Proxy model because the model is intended to set returns at the level required to incentivise investment in a stand-alone project with its own licence, while the Competition Proxy model exists only because the HSB project cannot have its own licence. The implication is that the return required under the Competition Proxy model will be higher than that for a stand-alone project. This is discussed further in section 2.1.

Notwithstanding the paradox of applying the Competition Proxy model to a project that will not have its own licence, we understand that CEPA has attempted to estimate the cost of capital as if HSB were a stand-alone project. However, the analytical framework for the stand-alone project that has been applied has several inconsistencies and omissions, which are discussed in section 2.2.

2.1 Paradox of the Competition Proxy model

As there is no project-specific licence under the Competition Proxy model, the HSB project will be delivered under the licence of NGET. This means that, in practice, the Competition Proxy model lacks key features of the stand-alone project finance model that it is intended to mirror:

- the Competition Proxy model does not provide HSB with legal rights to future cash flows that are distinct from the rights of NGET to future cash flows, and hence the HSB cash flows cannot be pledged as collateral to raise project finance;
- the Competition Proxy model does not provide the same level of legal protection, and hence predictability of future cash flows, that HSB would have under its own licence;
- the Competition Proxy model does not provide the same level of clarity and certainty over risk allocation that investors would have if HSB had its own licence;
- the Competition Proxy model exposes NGET to the risk that revenue allowances in future RIIO price controls will be reduced if HSB performs well;
- the Competition Proxy model exposes NGET to the risk of future regulatory intervention that reduces the cash flows of HSB (e.g. a review of cost allowances partway through the operational phase).

For the reasons set out above, the return required under the Competition Proxy model will be higher than that for a stand-alone project with its own licence. In other words, an investor would require a premium to invest in HSB under the Competition Proxy model relative to a scenario in which HSB were delivered under a separate licence.

2.2 Inconsistencies and omissions in CEPA's analytical framework

Notwithstanding the paradox of applying the Competition Proxy model to a project that will not have its own licence, we understand that CEPA has attempted to estimate the cost of capital as if HSB were a stand-alone project. However, the analytical framework that has been applied has the following inconsistencies and omissions, which undermine the reliability of the model and its conclusions.

1. The cost of capital does not appear to have been consistently developed on the basis of a stand-alone project with no recourse to a parent company—i.e. in places, the analysis appears to assume that financing costs will be lower than in a stand-alone project due to mixing corporate finance and project finance concepts.

2. The risk premium on unlevered equity is lower than the risk premium on debt in the operational phase, which is inconsistent with the relative priorities of claims on cash flows and assets in the event of financial distress and default.

3. The analytical framework does not provide a premium over the company's cost of capital to reflect the pricing of project-specific risks that would arise during a competitive process. As a result, the expected return is likely to be lower than the investment's cost of capital over the life of the project.

4. The current proposals lack clarity, which exposes the project to risks that are not necessarily present in projects that have already been undertaken, and which the CEPA cost of capital is based upon. This results in an inefficient allocation of risk and an increase in the cost of capital, as investors face the residual uncertainty when aspects of the regime are unclear.

2.2.1 Stand-alone project-specific cost of capital

Ofgem's views regarding the underlying principles of the Competition Proxy model appear to be consistent with considering a stand-alone project-specific cost of capital. In its consultation document, it states:

> We propose that the financing for the HSB project under Competition Proxy follows the principles for funding project-financed greenfield construction projects. This reflects the way in which we expect the project would be funded if it was subject to an efficient competition for the holistic financing, construction and operation of the HSB project.[5]

Given the statement above, the appropriate way to think about the project-specific cost of capital is within a project-financing framework with no recourse to the balance sheet of the parent company or a third party. This is recognised in Ofgem's consultation document, where it states:

> the Competition Proxy model involves setting a project-specific set of regulatory arrangements for a 25-year period (rather than setting them for a portfolio of assets for the period of a price control).[6]

This also forms the basis of its proposal to align certain key regulatory aspects of the Competition Proxy model with the existing OFTO and Interconnector regimes. Implicitly, this means that projects considered under the Competition Proxy model would effectively be considered to have their own licence—although in practice this will not be the case.

However, Ofgem's stated principles underpinning the Competition Proxy model are not consistently reflected in CEPA's analysis of the WACC for the HSB project. In particular, CEPA's analysis has not always been developed on a stand-alone basis reflecting project-financing principles. This is discussed in detail in sections 4 and 5 below.

[5] Ofgem (2018), p. 31.
[6] Ofgem (2018), p. 30.

2.2.2 Returns to equity relative to debt

A basic principle of corporate finance is that equity holders bear more risk than debt holders, as a result of which they require higher returns. The risk premium on unlevered equity must be higher than the risk premium on debt of the same company, since the latter stands in higher priority in any event of financial distress or bankruptcy. Ofgem's WACC proposals (as informed by CEPA's analysis) are inconsistent with this principle in the operations phase of the project. This inconsistency in the remuneration offered to equity holders is a significant error.

As discussed further in sections 4 and 5 below, CEPA's analysis of the cost of debt in both phases does not appear to have been developed on a stand-alone basis reflecting project-financing principles, and is underestimated. When combined with the proposal for an unlevered equity return that is lower than the debt return during the operational phase, this implies that the estimated return to equity holders is too low.

2.2.3 Lifetime project returns

The expected outcome of a competitive process is that expected returns are equal to the investment's cost of capital. The calculation of expected return will be based on probability-weighted cash flows across a range of scenarios. This requires an understanding of project-specific risks (e.g. cost overruns) and how they affect the expected internal rate of return (IRR) over the lifetime of the project. It also requires an understanding of what the cost of capital is over the lifetime of the project (i.e. a blended cost of capital of the construction and operational phases).

Neither Ofgem nor CEPA has provided any analysis comparing the project's expected lifetime IRR with the WACC for the lifetime of the project as implied by proposals presented in the current minded-to position. This is a serious omission. In the absence of such analysis, there is a risk that the expected lifetime IRR will be lower than the WACC. A competitive process would price downside shocks into the required return as a premium over the cost of capital such that the expected return is equal to the cost of capital. The Ofgem model does not support this.

2.2.4 Regulatory certainty

There is a lack of clarity and considerable uncertainty in Ofgem's proposals underpinning the Competition Proxy framework. This results in an inefficient allocation of risk and an increase in the cost of capital since investors face the residual uncertainty when aspects of the regime are unclear.

First, Ofgem is considering two options for when to fix the cost of capital.

Option one: Fix the cost of capital for both the construction and the operational phases at the project assessment stage

Option two: At project inception, fix the allowed construction phase cost of capital and set only an indicative cost of capital for the operational phase. The cost of capital for the operational phase would be finalised at the end of the construction phase based on the proposed methodology from CEPA[7]

[7] Ofgem (2018), p. 32.

CEPA's paper on the cost of capital focuses primarily on option one, and no analysis is presented of what option two would imply under different scenarios. Given CEPA's methodology for the operational phase cost of capital, option two effectively implies an element of indexation for both the cost of debt and cost of equity applicable in the operational phase. However, Ofgem mentions that this is subject to prevailing market conditions. This leaves open the possibility for a revised or alternative methodology. For example, it is not evident whether, under option two, the cost of equity in the operational phase would continue to be based on adjustments to equity IRRs of winning bids from the TR2 and TR3 tender rounds, or whether it would be benchmarked to TR4 and TR5.

Second, in relation to cost recovery, a number of key elements within the proposals lack specificity and raise the uncertainty regarding the application of an untested regime. Ofgem proposes to set indicative capital expenditure (CAPEX) and operating expenditure (OPEX) allowances at the project assessment stage that will be finalised only upon completion of the construction phase. As a result, NGET will face uncertainty regarding its final revenue allowance over the duration of the construction phase, after the project has been accepted and commenced. Specifically, the key issues are as follows.

- During the construction phase, Ofgem has proposed that underspend or efficient overspend for more certain CAPEX that NGET can control will be subject to a sharing factor (which is yet to be finalised). Uncontrollable costs will not be subject to this sharing factor, but will be subject to an unspecified 'expenditure review' to determine which of these costs will be included in an updated revenue allowance for HSB.[8] The uncertainty around these makes it difficult for NGET to undertake risk analysis, and thus harder for investors to evaluate the risks associated with the project.
- With respect to additional CAPEX needs during the operational phase (e.g. for additional capacity), Ofgem proposes that, if the required network upgrade meets competition criteria, it be will delivered using the CATO, SPV or Competition Proxy model. If it is shown not to meet the competition criteria, the additional CAPEX will be recovered based on the RIIO arrangements and market conditions at the time.
- OPEX allowances for the operational phase will be set only at the project assessment stage, assuming that the costs can be accurately estimated at that time.[9] Ofgem has proposed cost re-openers for OPEX and protection against force majeure events and unanticipated changes in law, but does not specify any thresholds that would trigger these re-openers.

Finally, there is uncertainty regarding how inflation will be recovered through revenue allowances, as Ofgem's approach to inflation will not be finalised until 2019. This uncertainty is an important factor as illustrated by Ofgem's recent RIIO-2 framework consultation—published subsequent to the consultation on the Competition Proxy model for HSB—which proposes to change the indexation of price controls from RPI to CPI(H).[10] Investors looking to evaluate the required return on this project without certainty regarding the treatment of inflation would have to consider different financing structures and the levels of returns that would be compatible with these structures. The uncertainty over

[8] Ofgem (2018), p. 34.
[9] Ofgem (2018), p. 35.
[10] Ofgem (2018), 'RIIO-2 Framework Consultation', March, para. 7.98.

the definition of 'real' returns would be priced into the investors' view on the level of returns required to invest in the project.

In a competitive process, these uncertainties would be priced in by investors by considering a range of probability weighted cash-flow scenarios describing the risks, and observing the impact on the expected returns. As several of the uncertainties are likely to be downside only, investors would target higher returns to offset these. With these uncertainties, the allowed WACC would need to be consistent with the adjusted expected returns based upon these probability weighted scenarios.

Even once all of these aspects are clarified, there will be some residual long-term regulatory uncertainty relative to OFTOs and interconnector projects as, de facto, the HSB project does not have its own licence. For the purposes of this report we have used an analytical framework that assumes that HSB has its own licence, and we have therefore made the assumption that long-term regulatory uncertainty is not a relevant factor in determining the rate of return under the Competition Proxy model.

3 Review of CEPA's methodology

3.1 Summary of the proposed methodology to estimate the project-specific WACC

In setting a WACC under the Competition Proxy model, Ofgem's overarching objective is to reflect the outcome of financing terms that are likely to be achieved in a competitive process for the construction and operation of the project. CEPA recognises this objective in its paper in stating:

> Ofgem's objective in setting the cost of capital for the Competition Proxy model is to achieve a value that is in line with the reasonable expectations of the resulting cost of capital from a competitive tender process.[11]

In its August 2017 consultation, Ofgem proposed that the WACC under the Competition Proxy model should be determined using 'appropriate benchmarks'.[12] In particular, Ofgem proposed a split cost of capital approach, implying independent estimates of the WACC for the construction and operations phases of the project.[13]

In implementing Ofgem's stated objectives for estimating the WACC, CEPA has essentially adopted a CAPM-based parameter-by-parameter estimation approach for the construction phase of the HSB project. The methodology inherently assumes that financing will be raised specifically for the duration of the construction period only. In particular, CEPA's proposed cost of debt estimate is based on spot and one-year average yields observed on iBoxx UK non-financial corporate and UK infrastructure bond indices of maturity of around five years, with an uplift to cover transaction costs and costs of carry. The proposed cost of equity estimate is based on the CAPM and largely considers a forward-looking approach to estimating the market parameters (i.e. the RFR and ERP). The beta and gearing estimates are benchmarked against observed beta and gearing estimates for regulated utilities and construction companies.

In contrast, CEPA's proposed WACC estimate for the second phase (the operational phase) is more reliant on benchmarking against returns observed from stand-alone infrastructure projects. In particular, for the cost of equity estimate, CEPA considers the OFTO data as a reference point. It then proceeds to make adjustments to the winning equity IRRs from OFTO bids in order to reflect movements in market parameters since 2013 (when data relating to the successful financial bids of these projects was first made available).

A key assumption underpinning CEPA's approach to estimating the WACC in both phases is that the regulatory arrangements will enable the HSB project to achieve an investment grade rating under a stand-alone, project-financed structure.

Below we explore the implications of CEPA's methodology for estimating the WACC for the HSB project.

[11] CEPA (2018), 'Review of cost capital ranges for new assets for Ofgem's Networks Division', 23 January, p. 5. Hereafter referred to as CEPA (2018).
[12] Ofgem (2017), 'Hinkley-Seabank – Consultation on Final Needs Case and potential delivery models', 30 August, p. 8.
[13] Ofgem (2017), 'Hinkley-Seabank – Consultation on Final Needs Case and potential delivery models', 30 August, p. 33.

3.2 Review of Ofgem and CEPA's proposals, and discussion of key methodological issues

The cost of capital allowance set by any 'proxy' approach that attempts to approximate the outcome of a competitive process should reflect the outcome of a competitive bidding process for project-financed greenfield infrastructure projects.

Regarding Ofgem's preference for a split cost of capital approach, there is no conclusive evidence that market investors have a set approach to financing large infrastructure projects. For instance, evidence from the Thames Tideway Tunnel project suggests that, at project inception, investors raised financing over a period that was materially longer than the project's construction phase (and also longer than the period over which the bid-WACC was applicable).[14] However, for as long as any split cost of capital estimate is internally consistent and results in a logical estimate for the lifetime WACC of the project, the exact nature of the split should not necessarily matter.

For the HSB project, and as acknowledged by CEPA, Ofgem's preference for a split cost of capital approach appears to be largely motivated by maintaining comparability between the operational phases of the OFTO projects and the Competition Proxy regime rather than evidence pertaining to investors' funding preferences and market strategies.[15] This creates a constraint on CEPA's methodology, which leads to a number of inconsistencies in its proposals.

The methodology to estimate the construction phase WACC is unreliable for the following reasons.

1. CEPA's estimate of the cost of debt (based on investment grade rated corporate bond indices) does not take sufficient account of the fact that the debt financing would be non-recourse, leading to higher risk. In contrast, project-specific investment risks in regulated utilities, and other corporates that feature in the iBoxx indices, are co-insured by the revenues from other projects that form part of the Regulated Asset Value or the overall asset base.

2. Furthermore, the cost of debt estimates do not reflect project-specific debt costs. The underlying assumption that HSB would achieve an investment grade credit rating in the construction phase is inconsistent with the projected level of cash flow and interest coverage that the project would have in the construction phase.

3. CEPA's estimate for the TMR appears unrealistic and does not reflect a balanced view of the available evidence. It also does not account for the negative relationship between the ERP and the RfR.

4. The companies adopted by CEPA to benchmark the project beta and gearing do not accurately reflect the risks associated with HSB.

For the operational phase, there are three inconsistencies in the analysis.

1. The WACC estimate of 0.60–1.75% implies that the risk premium on the asset (ranging from 0.69% to 1.32%) is below the risk premium on (lower-risk) debt instruments (ranging from 1.08% to 1.33%). This is fundamentally incorrect—the risk premium on unlevered equity assets must be higher than

[14] Tideway (2017), 'Debt summary – Q3 FY17/18', https://www.tideway.london/media/3805/debt-summary-update-q3-fy-17_18.pdf, accessed 22 February 2018.
[15] CEPA (2018), p. 5.

the risk premium on debt assets of the same company, since the latter stand in higher priority in any distress or bankruptcy.

2. CEPA's interpretation of OFTO benchmarks is inconsistent with its own explanation relating to regulatory regime risk.

3. The gearing estimate is inconsistent with the estimate of the cost of debt.

The following sections present details of Oxera's review of these aspects of Ofgem's proposals.

4 Review of CEPA's construction phase WACC proposals

4.1 Cost of debt

CEPA's range for the construction phase cost of debt (1.60–2.30% nominal pre-tax)[16] is based largely on spot and one-year average yields on a selection of investment-grade UK non-financial corporate and infrastructure bond indices. While it is unclear how CEPA selected its range from the observed data points, the lower bound of the range appears to have been informed largely by yields observed on A rated bond indices of relatively short maturities (c. five years). The upper bound is based on BBB rated indices.

In terms of benchmarking the cost of debt for the construction phase, Oxera does not agree with CEPA's methodology, for the following reasons.

1. The observed yields on the bond indices selected by CEPA do not provide a directly relevant benchmark for the HSB project. The yields observed from these indices reflect corporate finance rates of borrowing and not project finance rates, leading to an inconsistency with Ofgem's stated principles regarding the Competition Proxy framework.
2. CEPA's assumption that the project could achieve an investment grade credit rating in the construction phase[17] is not credible, based on metrics adopted by credit rating agencies.

On the first point, CEPA's proposals fail to adjust the observed corporate borrowing rates to account for the risks of a stand-alone, non-recourse project. Under the Competition Proxy model, the debt finance needs to be considered as non-recourse since HSB cannot be considered to be part of a portfolio of NGET's CAPEX projects. This is in contrast to the nature of the borrowing that is typically raised by the constituent firms in the bond indices. All else being equal, this will increase the cost of debt for HSB relative to these corporates. Furthermore, and as acknowledged by CEPA,[18] there is inherent uncertainty associated with the Competition Proxy regime because of its novelty, which adds to the risk associated with the HSB project.

With respect to achieving an investment grade credit rating, Ofgem's proposals appear to allow for the recovery of the cost of debt during the construction phase only—i.e. revenues are based on applying the allowed cost of debt to the previous year's closing debt balance. This would provide an interest cover of only c. 1x, which is significantly below that required to achieve stable investment grade credit rating.[19] In addition, the uncertain allocation of risks (as described in section 2) and lack of liquidity provisions prevents the application of a robust covenant structure, compounding the issues around achieving an investment grade rating.

Lastly, CEPA's approach of matching the term of the construction phase debt to the duration of the construction period does not take account of evidence from similar projects. Investors raise project debt financing in a number of ways depending on prevailing market conditions. For example, in the Thames Tideway Tunnel project, the term of the debt raised by Bazalgette Tunnel Limited at project inception extended well beyond the expected six-year

[16] CEPA (2018), op. cit., p. 32. This excludes transaction costs and cost of carry.
[17] CEPA (2018), op. cit., p. 30.
[18] CEPA (2018), op. cit., p. 30.
[19] Moody's (2018), 'Britain's electricity regulator proposes framework that sharply lowers returns for new transmission projects', 29 January, p. 2.

construction period of the project.[20] In fact, CEPA's analysis of the construction phase does not take into consideration evidence from any relevant benchmark infrastructure projects.[21]

Overall, CEPA's methodology does not represent a realistic estimate of the debt financing costs for the construction phase of the HSB project.

4.2 Total market returns

CEPA's estimates for the total equity market return in the construction phase are largely reliant on outputs from two specific dividend growth models (DGMs) resulting in a nominal TMR range of 7.5–8.5%.[22] This is below the long-term average of 11.2%.[23]

CEPA's justification for relying on DGMs for the construction phase cost of equity is based on the claim that:

> Historic returns are most suitable for long-term investments where investments are being made on a rolling basis, whereas forward-looking evidence is most appropriate with one-off investments and a short-term investment horizon, such as with the IDC.[24]

This claim is then translated into a statement that equates forward-looking measures with the DGM:

> Given the relatively short construction period assumed of up to five years, we focus on prevailing market evidence, placing more weight on forward-looking measures of expected return, such as the DGM, rather than long-term historic averages[25]

Using a completely different methodology to estimate the TMR for a long-term horizon as compared with a short-term horizon is unconventional, and CEPA's justification is not convincing. This approach limits CEPA's evidence base for the construction period TMR to a sub-set of DGMs and, given the sensitivity of DGMs to the input assumptions, this undermines the robustness of the estimates.

CEPA's approach to how the TMR may vary over time omits a key aspect of the current TMR debate. The central issue in the current debate is the degree to which the expected ERP adjusts to offset changes in the RfR. The theoretical and empirical evidence base for assuming a stable ERP, and hence a TMR that changes significantly over time, appears weak.

- Consumption-based asset pricing models find that higher economic uncertainty simultaneously places downward pressure on the RfR and upward pressure on the ERP.[26]

[20] Tideway (2016), 'Bond Investor Presentation', p. 21, May, https://www.tideway.london/media/2587/tideway-bond-investor-presentation-may-2016-final.pdf, accessed 22 February 2018. This corresponds to a BBB+ rating from S&P.
[21] While not all infrastructure projects would raise financing purely for the construction phase, and hence there may be some differences in maturity and risk profile, they nevertheless constitute important data points in understanding the relationship between the implications of split cost of debt analysis for the lifetime cost of debt of the project.
[22] CEPA (2018), p. 38.
[23] Dimson, E., Marsh, P. and Staunton, M. (2017), 'Credit Suisse Global Investment Returns Yearbook 2017', p. 212.
[24] CEPA (2018), p. 13.
[25] CEPA (2018), p. 37.
[26] Martin, I. (2013), 'Consumption-Based Asset Pricing with Higher Cumulants', *Review of Economic Studies*, **80**, pp. 746; Vlieghe, G. (2017), 'Real interest rates and risk', Society of Business Economists' Annual conference, 15 September.

- Historical data shows that the RfR and ERP have been volatile while total equity market returns have been more stable over time, and calls into question the assertion that equity markets are going through a period of 'secular stagnation'.[27]

- Estimates of the TMR from dividend discount models suggest that it is relatively stable over time and is currently no lower than its estimated value in the early 2000s.[28]

There is also important support in the academic literature, which has examined the negative correlation between the estimates of the RfR and ERP, suggesting that the TMR is relatively stable (such that changes in the RfR are largely offset by changes in the ERP)—which is not acknowledged by CEPA or Ofgem. Some examples are provided below.

- Evidence previously relied on by Ofgem, from Mason, Miles and Wright (2003), proposed a methodology in which the TMR should be assumed constant (implying a one-for-one offsetting change in the RfR and ERP),[29] and set in the light of realised historical real returns over long samples. The authors noted that there was considerably higher uncertainty about the true historical RfR, and the ERP, than there was about the TMR.[30]

- This academic view was supported in a later paper by Wright and Smithers (c. 2014–15), which concluded that 'real market cost of capital should be assumed constant, on the basis of data from long-term historic averages of realised stock returns'.[31] The authors implied a negative correlation coefficient of 1: 'It is therefore an application of simple arithmetic to conclude that, applying our methodology, the (assumed) market risk premium and the RfR must move in opposite directions: ie, must be perfectly negatively correlated.'[32]

- A similar conclusion about the relative stability of the TMR over time was drawn for the US market. A study in the USA found that the ERP was inversely related to the RfR—i.e. as the RfR fell, the ERP increased.[33] Specifically, the authors concluded that, for the period 1986 to 2010, using data from the S&P 500, the coefficient of the relationship between the interest rate and the ERP was -0.79, such that a 1% decline in the RfR would be offset by a 0.79% increase in the ERP.[34]

Overall, a balanced view of the evidence supports the conclusion that an appropriate TMR assumption would place more weight on the view that the expected TMR is relatively stable over time. Through choosing to place no weight on historical average equity market returns, CEPA's approach to estimating the TMR does not engage with this issue at all. The lack of robustness of CEPA's analysis (by limiting the evidence base to the outputs from two DGMs) can be seen by comparing these estimates with those based

[27] Òscar, J., Knoll, K., Kuvshinov, D., Schularick, M. and Taylor, A. (2017), 'The Rate of Return on Everything, 1870–2015', Federal Reserve Bank of San Francisco Working Paper 2017-25, p. 41.
[28] See appendix A1.
[29] Constant TMR reaffirmed as a conclusion of the 2003 paper in a later paper in 2014–15 (cited below).
[30] Wright, S., Mason, R. and Miles, D. (2003), 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K., On behalf of Smithers & Co', 13 February.
[31] Wright, S. and Smithers, A. (undated), 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', https://www.ofgem.gov.uk/ofgem-publications/86100/wrightsmithersequitymarketreturnpdf, para. 2.
[32] Wright, S. and Smithers, A. (undated), 'The Cost of Equity Capital for Regulated Companies: A Review for Ofgem', https://www.ofgem.gov.uk/ofgem-publications/86100/wrightsmithersequitymarketreturnpdf, p. 16.
[33] Harris, R. and Marston, F. (2013), 'Changes in the Market Risk Premium and the Cost of Capital: Implications for Practice', *Journal of Applied Finance*, **1**.
[34] Harris, R. and Marston, F. (2013), 'Changes in the Market Risk Premium and the Cost of Capital: Implications for Practice', *Journal of Applied Finance*, **1**, pp. 6–7.

on the dividend discount model used by the Bank of England—the CEPA estimates are c. 200–300 basis points lower.[35]

4.3 Beta and gearing

CEPA's comparator set used to benchmark the beta for HSB is unreliable. The comparator set places a disproportionately large weight on companies that focus on commercial and residential property development, property investments, and other property services such as home repairs. For example, Spirax-Sarco Engineering, which has the largest influence on the measured beta for HSB, manufactures steam management systems and peristaltic pumps. HomeServe, another important comparator used in CEPA's analysis, provides home emergency and repair services. Together, these two firms alone inform nearly half (44%) of the beta estimate for HSB.

The fundamental risks associated with the companies in CEPA's comparator set are very different from those associated with HSB. Foremost among these differences is the fact that, given the nature of their businesses, the asset risk of these comparator companies is more likely to be in alignment with that of providers of goods and services than that of long-term infrastructure developers and owners. It is also not clear what the underlying asset base of these comparator firms is, or whether they are able to raise secured financing. This fact is implicitly reflected in the low levels of observed financial leverage of these firms, a point that is also recognised by CEPA.

In terms of gearing, CEPA's estimates are based on a very wide range, derived from the observed gearing of construction companies and a sample of interconnector projects.

As discussed above, we do not consider the construction companies to be relevant comparators. While interconnector projects appear to be more suitable comparators and have considerably higher gearing than the construction companies, we agree with CEPA's concern about whether the impacts of Brexit would allow for such high levels of gearing to be replicated in HSB.[36]

Given the limited value of the evidence considered by CEPA, the estimates are heavily dependent on judgement. CEPA states that:

> This gives us a very broad range for gearing. If pure construction and engineering comparators were relevant, we would expect to see very low gearing in the region of 10%. The more that regulatory protections mitigate risks, the more we would expect to see highly leveraged structures of 65% or more, as with onshore networks.[37]

It adds:

> The evidence on gearing is therefore highly varied…While there are other estimates possible, we use the mid-point of our wide range, i.e. 37.5%.[38]

Overall, the benchmarking analysis prepared by CEPA is not supported by robust evidence and does not provide an adequate basis for quantifying the asset risk and financial leverage of HSB.

[35] The version of the dividend discount model used by the Bank of England indicates a real TMR of at least 7.5%. See appendix A1 for details.
[36] CEPA (2018), p. 45.
[37] CEPA (2018), p. 46.
[38] CEPA (2018), p. 46.

5 Review of CEPA's operational phase WACC proposals

5.1 Risk premium for debt and asset holders

CEPA's analysis has produced an inconsistency in its estimates of the cost of equity and cost of debt for the operational phase. Its analysis suggests that the remuneration required for the risks associated with the assets of the project is lower than that accorded to the debt on the same assets. Given that debt has a higher priority over equity in the payment of interest and also in the event of financial distress or bankruptcy, investors in the assets (unlevered equity) should be more highly rewarded. This does not appear to be the case in CEPA's analysis and suggests a significant inconsistency.

Although CEPA does not provide detailed parametric estimates of the cost of equity in the operational phase, given its estimates relating to the RfR, cost of debt, cost of equity and gearing, and its assumption of a zero debt beta, it is possible to ascertain the asset risk premium and the debt risk premium. This is demonstrated below.

$$DRP = CoD - RfR \quad (1)$$

$$ARP = \beta_a * ERP \quad (2)$$

$$\beta_a = (1-g)\beta_e + g * \beta_d \quad (3)$$

As per the CAPM:

$$CoE = RfR + \beta_e * ERP \rightarrow \beta_a = (1-g) * \frac{CoE - RfR}{ERP} \quad (4)$$

Substituting (4) in (2) and assuming $\beta_d = 0$:

$$\beta_a = (1-g) * \frac{CoE - RfR}{ERP} \rightarrow ARP = (1-g) * (CoE - RfR) \quad (5)$$

where:

$DRP = Debt\ risk\ premium$; $ARP = Asset\ risk\ premium$; $RfR = Risk\ free\ rate$; $ERP = Equity\ risk\ premium$; $g = gearing$;

and:

$$\beta_a, \beta_e, \beta_d = asset\ beta, equity\ beta\ and\ debt\ beta\ respectively.$$

Table 5.1 below provides the empirical evidence underlying the inconsistency.

Table 5.1 Implied asset and debt risk premium based on CEPA's proposal

Parameter	Source	Operations phase—low	Operations phase—high
Debt beta	p. 16 in CEPA report	0	0
Gearing	p. 58 in CEPA report	85%	80%
Nominal cost of equity	p. 57 in CEPA report	7.0%	8.5%
Nominal cost of debt	p. 61 in CEPA report	3.50%	3.75%
Implied RfR*	pp. 56 and 61 in CEPA report	2.42%	2.42%
Asset risk premium	Based on equation 5 above	**0.69%**	**1.32%**
Debt risk premium	Based on equation 1 above	**1.08%**	**1.33%**

Note: * Based on CEPA's spot estimates for yields on 20-year nominal gilts adjusted for CEPA's expected changes in gilt yields to 2024 based on forward rates.

Source: Oxera analysis of CEPA's estimates.

As shown above, both the low and high estimates of CEPA's cost of equity and cost of debt proposals are inconsistent with the hierarchy of claims on assets and cash flows, leading to a perverse outcome. Specifically, at the lower bound the reward for risk given to debt holders in the operational phase is 1.08%, and the reward for the assets is 0.69%.[39] Similarly, at the upper bound of the proposals for the operational phase, the reward for risk faced by debt holders is 1.33% compared with 1.32% for the return on assets. The latter must be greater than the former because, for a given project, equity is riskier than debt.

As explained below, CEPA's cost of debt assumption is likely be an underestimate of HSB's true borrowing costs. The inconsistency between the cost of equity and the cost of debt suggests that CEPA's cost of equity estimate for the operational phase needs to be significantly revised upwards.

5.2 Benchmarking the cost of equity

For benchmarking the operational phase WACC, and, in particular the cost of equity, Oxera agrees that the OFTOs provide relevant benchmark data, as this relates to equity investors' expectations of returns from stand-alone projects.

CEPA considers the second and third OFTO tender rounds (TR2 and TR3) to be more relevant comparators than the first tender round (TR1), as these provide more recent data points and are devoid of the uncertainty relating to TR1 (presumably because it was a first-of-its-kind tender). However, unlike TR2 and TR3, the Competition Proxy model is a first-of-a-kind regime and, as such, is associated with all the uncertainties that characterise untested regimes. For precisely this reason, TR1 presents a better anchor point for benchmarking the operational phase of the Competition Proxy model.

In addition, CEPA's analysis of the relative risks of the OFTO and Competition Proxy regimes draws some conclusions that do not appear to be supported by the evidence. For example, it is not clear how CEPA concludes that the risks

[39] Assuming CEPA's estimate for the RfR (2.42%), an ERP of 4.58% (derived from a TMR estimate of 7.50% and an RfR of 2.42%), and gearing of 85%, the implied asset beta at the low end of CEPA's estimates for the operations phase WACC is 0.14. Such an estimate for the asset beta is significantly lower than any other estimated asset beta for a utility. It is this low asset beta that leads to a low return on assets and an inadequate levered equity return. Note that the low end of the TMR estimate for the operations phase is assumed to be the same as CEPA's estimate for the construction phase.

around additional CAPEX requirements in the operational phase are similar between OFTOs and the Competition Proxy model. OFTOs have an explicit cap that allows them to refuse to undertake any expenses that exceed 20% of the original investment. In contrast, no such cap exists under the Competition Proxy model. OFTOs also operate under a licensed regime, whereas in practice HSB will not benefit from the protection of having its own licence, which means that the OFTO returns are based on a regime with a higher level of legal protection and certainty. The true return required under the Competition Proxy model will be higher than estimated by CEPA due to the absence of the legal protection that a separate licence for HSB would provide.

5.3 Gearing and cost of debt

With respect to the cost of debt, CEPA's proposed methodology relies on rates that reflect corporate finance borrowing.[40] This is another violation of the project-finance principles underpinning the Competition Proxy model (as previously identified in the construction phase estimate of the cost of debt). It also suggests that risks associated with the non-recourse nature of HSB's debt and the novelty of the Competition Proxy regime are not adequately accounted for, and therefore that the cost of debt estimates for the operational phase are too low.

CEPA's proposal for the gearing level of the operational phase is derived from observations for various OFTO projects. Here, in apparent contradiction to its assumptions for benchmarking the cost of equity, CEPA considers the TR1 projects to be relevant benchmarks. CEPA estimates a gearing range of 80–85% based on the gearing levels observed from OFTOs, even though one TR2 OFTO project has a significantly lower gearing of 50%.[41]

This gearing range of 80–85% appears to be too high because: (a) evidence from comparator projects and analysis from ratings agencies suggests that such high levels of debt are likely to be unsustainable for the HSB project on a stand-alone basis; and (b) the gearing range proposed by CEPA appears to be inconsistent with the assumptions underlying its cost of debt estimate.

On the first point relating to the assumed level of gearing of 80–85%, evidence from comparator infrastructure projects suggests that CEPA's gearing assumption is high. For example, covenants associated with some of the bond financing raised by Bazalgette Tunnel Limited for the Thames Tideway Tunnel project suggest that Bazalgette Tunnel Limited would lose investment-grade rating above 70% gearing, and that, above 80%, it would be in technical default.[42]

This view is repeated in analysis conducted by credit rating agencies that is specific to the HSB project, albeit assuming that the project is financed on the balance sheet of National Grid rather than on a secured project financing basis. Moody's states:[43]

> NGET's adjusted interest coverage ratio has been above 3.0x in two out of the past three financial years, and generally well above the 1.2x that we expect for a mid-Baa rating. Based on the Ofgem advisor's assumptions, we estimate that **the adjusted interest coverage ratio on the HSB project, if it were**

[40] CEPA's estimate is based on observing yields from investment grade corporate bond indices of long-term maturities.
[41] This refers to the Lincs offshore transmission project. See CEPA (2018), pp. 57–58.
[42] Tideway (2016), 'Bond Investor Presentation', May, https://www.tideway.london/media/2587/tideway-bond-investor-presentation-may-2016-final.pdf, p. 16, accessed 22 February 2018.
[43] Moody's (2018), 'Britain's electricity regulator proposes framework that sharply lowers returns for new transmission projects', 29 January, p. 2.

> **considered on a standalone basis, would be well below 1.0x** [emphasis added]

It adds:

> We note that OFTOs are able to support high leverage in part because of their secured project financing structures, which would not expect to be open to National Grid.[44]

On the second point, CEPA considers that the iBoxx UK A and BBB rated non-financial corporate bond indices of 10+ years' maturity estimate the operations phase cost of debt. The average gearing of the constituent firms in these iBoxx A and BBB bond indices is c. 30%, with the highest observed gearing being c. 60% (United Utilities) across both indices.[45] CEPA bases its cost of debt estimate on observed yields for firms with low to medium levels of gearing, but then proceeds to assume a notional level of gearing well above the one informing its cost of debt estimate. This apparent inconsistency between CEPA's cost of debt and gearing potentially violates the Modigliani–Miller[46] principle that higher gearing increases required returns on debt, and merits a review.

5.4 Inflation

CEPA's approach to estimating RPI inflation is to use implied inflation from index-linked debt relative to nominal debt ('breakeven inflation'). In principle, this is an acceptable approach, particularly when breakeven inflation is computed from the shorter end of the yield curve.

However, currently, the instantaneous forward yield curve is 'humped'—i.e. interest rates on medium-term gilts are higher than the rates on both long- and short-term gilts. This typically reflects investor uncertainty about market conditions, and any inferences based on the long end of such a yield curve need to be viewed with caution.

CEPA estimates RPI inflation to be 3.0% for the construction phase (based on five-year breakeven inflation) and 3.0–3.4% in the operations phase (based on 10- and 20-year breakeven inflation). No structural explanation is provided for why RPI inflation would diverge from the 3% level that is consistent with the 2% CPI inflation targeted by the Bank of England. Therefore, in light of the shape of the yield curve, it would be prudent to place more weight on evidence from the shorter end of the curve and on official (e.g. Office for Budget Responsibility or Bank of England) and consensus forecasts.

[44] Moody's (2018), 'Britain's electricity regulator proposes framework that sharply lowers returns for new transmission projects', 29 January, p. 3.
[45] Oxera analysis based on data from Datastream and Bloomberg.
[46] Modigliani, F. and Miller, M. (1958), 'The Cost of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review*, **48**:3, pp. 261–97.

A1 Evidence on total market returns from the dividend discount model

The Bank of England regularly estimates the ERP based on a dividend discount model (DDM).[47] The Bank of England has suggested that equity risk premia are facing upward pressure, based on estimates derived from the DDM:

> The Bank's calculations show that the equity risk premium (ERP) may have roughly doubled from its perhaps unsustainably low level at the turn of the century during the dot-com boom. This rise in the ERP has been working vigorously against the fall in the risk-free rate…Members of the Bank's Monetary Policy Committee have argued that interest rates are as low as they are not because of coordinated central bank whim but because there is so much caution in the system…People seem to think some catastrophic outcome is possible, and this in turn pushes up the ERP. Whatever is going on, it hangs over the economy as well as the banks, and it should not be underestimated.[48]

Generally, asset pricing models that incorporate the potential for catastrophic (i.e. negatively skewed) economic outcomes or less restrictive assumptions about the preferences of consumers and investors will generate a higher ERP. This provides a theoretical basis for the ERP estimates implied by the DDM.

In the DDM, the expected TMR is the discount rate at which the present value of future dividends is equal to the current market price of the shares. In the context of estimating the return for the whole UK equity market, data on the FTSE All-share index is typically used.

Oxera has constructed a DDM following the Bank of England methodology. The outputs from the Oxera model closely match those reported by the Bank of England: the ERP calculated from the model for February 2017 is 8.9%, compared with approximately 9.0% reported by the Bank of England.[49] This estimate is 400bp higher than the historical arithmetic average excess equity return reported by DMS, consistent with the view that changes in the RfR are largely offset by changes in the ERP.

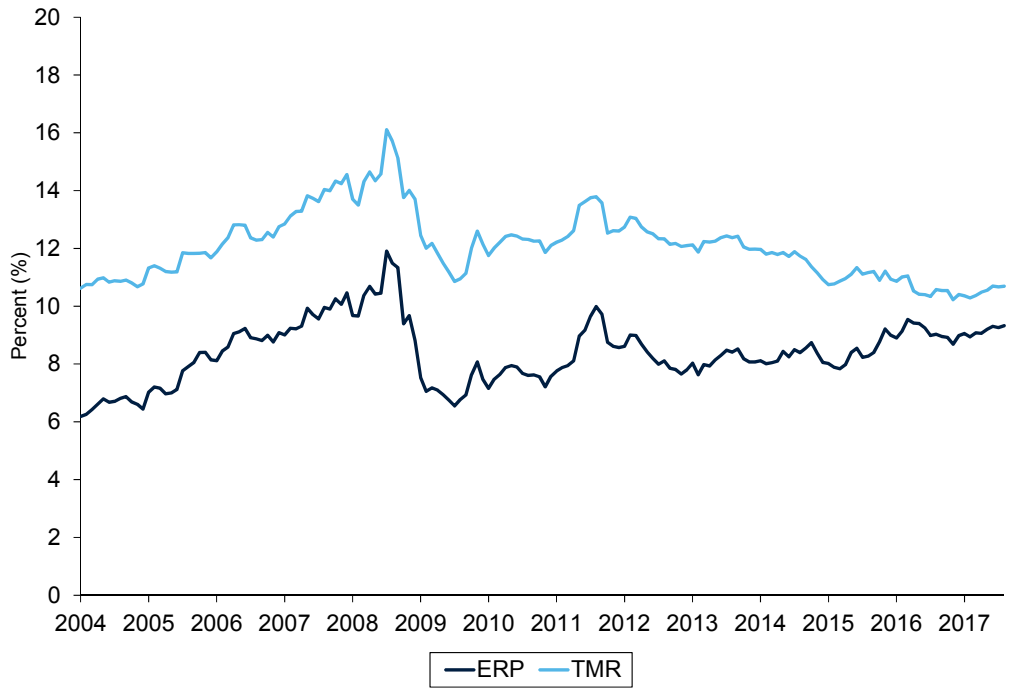
It is not possible to infer the TMR directly from the ERP estimates published by the Bank of England because the Bank of England uses multiple interest rates across the whole yield curve. However, the Oxera model enables a TMR to be calculated that is internally consistent with the Bank of England methodology. Figure A1.1 presents the TMR estimates since 2004, which are volatile over time but appear to revert to a longer-term average; whereas the ERP estimates appear more volatile. The figure also shows that the expected TMR is not currently abnormally low and has not followed the downward trend in interest rates over this period.

[47] The Bank of England regularly published ERP estimates in its Financial Stability Reports based on the DDM outlined in Inkinen, M., Stringa, M. and Voutsinou, K. (2010), 'Interpreting equity price movements since the start of the financial crisis', *Bank of England Quarterly Bulletin*, **50**:1, pp. 24–33. This model has since been improved in Dison, W. and Rattan, A. (2017), 'An improved model for understanding equity prices', *Bank of England Quarterly Bulletin 2017 Q2*.

[48] Taylor, M. (2016), 'Banking in the Tundra', speech by Martin Taylor, External Member of the Financial Policy Committee, Bank of England, Official Monetary and Financial Institutions Forum City Lecture, London, 25 May.

[49] Dison, W. and Rattan, A. (2017), 'An improved model for understanding equity prices', *Bank of England Quarterly Bulletin 2017 Q2*.

Figure A1.1 Nominal TMR and ERP based on a DDM for the FTSE All-share index



Note: ERP estimates take account of the full profile of the nominal yield curve.

Source: Oxera analysis based on Bloomberg, Thomson Reuters Datastream, and IMF World Economic Outlook.

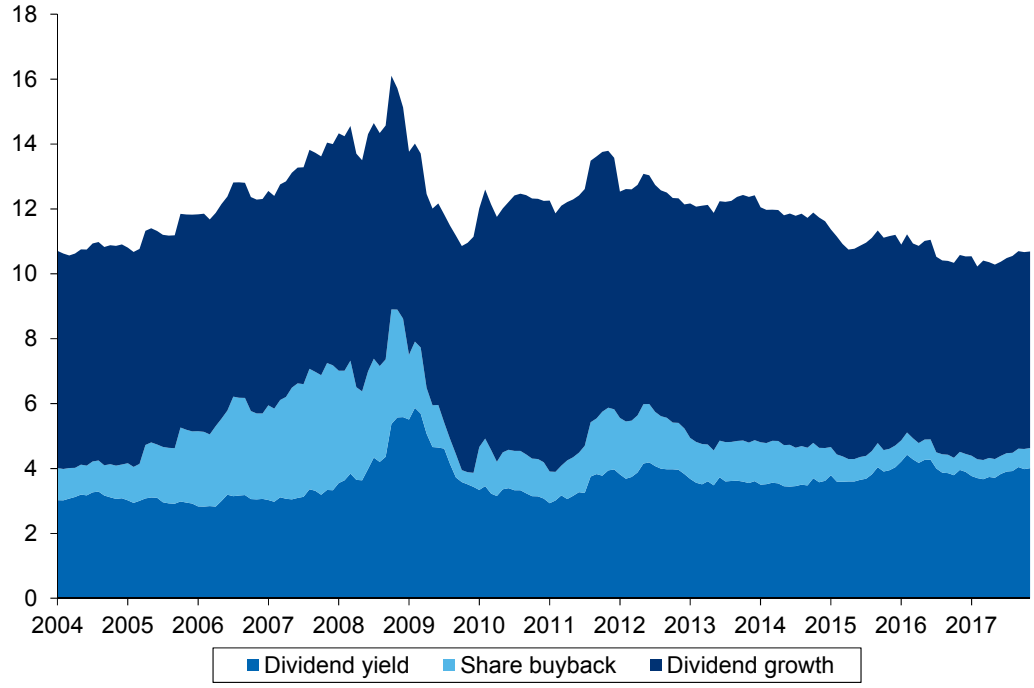
To examine whether the assumptions driving the current estimates appear reasonable, Figure A1.2 below breaks down the components of the TMR estimate in Oxera's DDM model into the following:

- the dividend yield;
- the share buyback yield;
- dividend growth rates.

A key concern with the DDM model is the assumption about the dividend growth rate. Figure A1.2 shows that the assumption for future growth in dividends accounts for more than half of the TMR estimate implied by the DDM. However, the figure shows that this rate is currently consistent with historical expectations of dividend growth. Figure A1.2 also shows that the dividend yield—linked to actual dividends paid—is currently near its highest level since 2004. This provides some comfort that the DDM estimate is based on reasonable assumptions.

The Bank of England model links the long-term dividend growth rate to forecasts of long-term growth rates of gross domestic product (GDP) for a weighted sample of countries. This is because the UK-listed companies in the index used in the DDM operate internationally and derive a significant proportion of their revenues from outside the UK. As such, the growth and risk of their dividends will be affected by international economic developments.

Figure A1.2 Components of the TMR (nominal)



Source: Oxera analysis based on Bloomberg, Thomson Reuters Datastream, and the IMF World Economic Outlook.

Deflating the TMR in Figure A1.2 by expected RPI inflation currently suggests a required real equity market return of 7.5%.[50]

As discussed, the DDM is highly sensitive to the dividend growth rate assumptions, and in particular the long-term growth rate. To illustrate this sensitivity, a one-stage DDM was estimated using forecasted GDP growth for the UK as opposed to a weighted sample of countries. This resulted in a real equity market return of 5.4%.[51] This approach is conservative in comparison to the multi-stage DDM because:

- it does not incorporate analyst forecasts of dividend growth over the short term, which are generally higher than long-term GDP growth rates;
- the long-term growth assumption considers only UK GDP growth, which is a conservative assumption since companies listed on the London Stock Exchange are generally exposed to international markets which, on average, have higher GDP growth rates than the UK.

The TMR estimates from a DDM correspond to the implied annual return expected on an investment that is held in perpetuity, assuming that the dividend growth rate is serially uncorrelated and a stationary dividend yield.

Investments that are not held in perpetuity are subject to an additional source of risk in annual returns—the higher volatility of the annual rate of capital gain relative to the volatility of the dividend growth rate—i.e. volatility of the price–earnings ratio.

Estimates of the risk premium for a one-year holding period relative to a perpetual holding period depend on the volatility of the annual rate of capital

[50] Using an RPI assumption of 3.0%.
[51] The input assumptions are: dividend yield (4.0%), buyback yield (0.6%), real GDP growth rate (0.7%).

gain relative to the volatility of the dividend growth rate. Fama and French (2002) estimated this adjustment to be 130bp based on US data.[52]

Investors in energy networks would be expected to have investment horizons longer than one year. On this basis, some increase to DDM-based estimates of the TMR to account for price–earnings ratio volatility appears appropriate.

Overall, the evidence from the DDM is consistent with the view that the TMR is a relatively stable parameter over time, and that changes in the ERP largely offset changes in the RfR. CEPA's approach to estimating the TMR does not engage with this issue at all. The lack of robustness of CEPA's analysis (by limiting the evidence base to the outputs from two DGMs) results in estimates of the TMR that are c. 200–300 basis points lower than those estimated by the Bank of England.

[52] Fama, E. and French, K. (2002), 'The Equity Premium', *The Journal of Finance*, **LVII**:2, pp. 654–657.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