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Review of Ofgem's Initial Proposals for TPCR
A Report for EdF Energy

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Executive Summary

Ofgem has published its initial proposals for Transmission Price Control Review (TPCR 2006) applying to the four transmission companies to be used in setting prices over 2007-12.[1] This report reviews Ofgem's proposals for the cost of capital and approach to financeability.

Table 1 compares Ofgem's proposed cost of capital with our initial views on the cost of capital for the UK transmission companies, based on discussion and analysis presented within this report. We present two estimates; the first based on a cost of equity of 8.0% derived a CAPM analysis and the second based on a cost of equity of 8.3% derived from a DGM analysis. Our initial estimate of the cost of capital for the transmission companies is a range of 4.7% to 4.9%. This is significantly higher than Ofgem's initial proposal of 4.2%.

Table 1
Comparison of Ofgem Estimates of WACC for TPCR 2006 and DPCR 2004

	TPCR (2006)	DPCR (2004)
D/(D+E)	60%	57.5%
D/E	1.50	1.35
Corporate tax rate	30%	30%
Risk free rate (real)	2.30%	2.75%
Cost of Equity		
Equity risk premium	5.20%	4.75%
Asset beta (implied by gearing and equity beta)[1]	0.36	0.43
Equity beta	0.90	1.00
Cost of equity	**6.98%**	**7.50%**
Cost of debt		
Debt Premium	1.10%	1.35%
Cost of debt	**3.40%**	**4.10%**
WACC		
Real pre-tax WACC	**6.03%**	**6.91%**
Real post-tax WACC net of post-tax debt shield	**4.22%**	**4.84%**

(1) Assuming the Miller adjustment was used to re-lever asset betas for debt/equity.

The main driver of the difference between NERA and Ofgem is the cost of equity estimate. At both TPCR 2006 and DPCR 2004 Ofgem's view on the overall cost of equity appears to be guided by long run average arithmetic returns on the equity market as a whole, based on such evidence as presented by Smithers and Co.[3] However, the Smithers & Co analysis uses a mix of historic returns (for total equity returns) and forward-looking data (for the risk free rate). As discussed in recent NERA reports for EdF, estimates of the WACC based on a mix of historical and current data are internally inconsistent and susceptible to bias.

Our initial analysis of the cost of equity for transmission companies using CAPM gives an estimate of 7.7%, significantly higher than Ofgem's estimate of 7.0%. The difference is due

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[1] National Grid Electricity Transmission (NGET), National Grid Gas NTS (NGG), Scottish Hydro-Electric Transmission (SHETL) and Scottish Power Transmission (SPTL).

[3] Smithers and Co. (2003) "A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK", February 2003

large to a higher estimate of the Risk-Free Rate, at 2.5% (based on evidence on yields of European index linked assets rather than UK assets), and a slightly higher estimate of the equity beta, at 1.0.

Ofgem claims that its DGM analysis gives a cost of equity consistent with the proposed cost of equity. However, Ofgem does not set out details or results of this analysis. Our own DGM analysis of the cost of equity, summarised in this paper, indicates a cost of equity of at least 8.2% (excluding issuance costs). The difference between the NERA and Ofgem DGM estimates may be based on a number of methodological errors that Ofgem made previously when applying DGM models and which may be repeated in its DGM analysis for TPCR 2006. We discuss these errors further in this report and in NERA (2006d).

With respect to financeability, Ofgem's states that its financial modelling shows projected financial ratios that lie within the targets for transmission companies indicated by Standard and Poor's. However, the ratios specified are significantly lower than those specified at DPCR 2004 and are much lower than those identified by NERA as consistent with a single A credit rating. Ofgem's financial modelling also assumes that a proportion of new funding for capex will be funded by issuing new equity but appears to make no allowance for the costs of new equity issuance in its overall allowed rate of return.

Hence, despite Ofgem's best efforts to produce a transparent and consistent estimate of the cost of capital, key evidence is missing and definable inconsistencies are emerging, such that Ofgem's estimate of the cost of capital appears to be too low to meet defined financeability standards.

1.   Introduction

As part of the Transmission Price Control Review (TPCR), Ofgem has published its initial proposals for the cost of capital to be used in setting prices for the four gas and electricity companies over the period 2007-12. This report reviews Ofgem's initial proposals on the cost of capital for TPCR and compares these proposals with the final proposals at DPCR 2004.

This report refers to the following Ofgem publications:

§   Ofgem (2000) "The transmission Price Control Review of the National Grid Company from 2001. Transmission Asset Owner. Final Proposals", September 2000.

§   Ofgem (2001) "Review of Transco's Price Control from 2002. Final Proposals", September 2001.

§   Ofgem (2004a) "Electricity Distribution Price Control Review. Background Information on the Cost of Capital", March 2004.

§   Ofgem (2004b) "Electricity Distribution Price Control Review. Final Proposals", November 2004.

§   Ofgem (2005) "Extending National Grid Electricity Transmission plc's Transmission Owner Price Control for 2006/07", November 2005.

Where relevant, we also refer to the following NERA reports:

§   NERA (2004a) "UK Electricity Distribution Cost Of Capital. A Report for EDF Energy", March 2004.

§   NERA (2004b) "Cost of Equity Estimates for Electricity Distribution Network Operators using a Dividend Growth Model. A Report for the Distribution Network Operators", May 2004.

§   NERA (2004c) "Use of Financial Ratios at DPCR4. A Report for the DNOs", July 2004.

§   NERA (2006a) "Applying the CAPM – The Case for Long Term Time Series Data. Issue Paper 1 for EDF Energy Plc", April 2006.

§   NERA (2006b) "Alternative Regulatory Methods for Estimating the Cost of Equity. Issue Paper 2 for EDF Energy plc", April 2006.

§   NERA (2006c) "Financeability Adjustments. Issue Paper 5 for EdF Energy", April 2006.

§   NERA (2006d) "DGM Cost of Equity Estimates for UK Transmission Companies. A Report for EDF Energy", July 2006.

This report is structured as follows:

§   Section 2 discusses the risk-free rate;

§   Section 3 discusses beta;

§   Section 4 assesses Ofgem's approach to estimating the equity risk premium;

§   Section 5 assesses Ofgem's overall approach to estimating the cost of equity;

§   Section 6 discusses the debt premium;

§   Section 7 presents our initial view on the cost of capital for the transmission companies; and

§   Section 8 discusses financeability and issuance costs.

2.   The Risk-Free Rate

Ofgem (2006) states that the risk-free rate of 2.3% is estimated as the ten year average of the yield on a ten year maturity UK Index-Linked Gilt (ILG). Ofgem does not set out the rationale for this approach.

The approach used by Ofgem (2006) differs from Ofgem's previous approach at DPCR 2004. Ofgem (2006) reports that the risk-free rate used at DPCR 2004 was 2.75%,[6] but the 2004 decision did not set out any clearly defined methodology for estimating the risk-free rate. Ofgem's range of 2.25% to 3.00% at DPCR 2004 seemed to be derived simply by widening the most recent (at the time) range used by the Competition Commission to account for uncertainty around the expected risk-free rate.

At TPCR 2006 Ofgem uses a ten year historical average of UK ILG yields to estimate the risk-free rate. This is a more robust methodology than used previously. [7] As set out in NERA (2006a), Ofgem's use of longer term time series will ensure internal consistency with other WACC parameters and prevent estimates from being biased by temporary and/or distorted markets and institutional factors. However, time-series data can only mitigate distortions where the period of distorted data is limited relative to the overall period of measurement.

For this reason, we do not agree with Ofgem's use of UK ILG yields over the past ten years. As discussed in NERA (2006a), it is widely acknowledged by regulators, market practitioners and commentators that UK gilt yields were biased from 1997 onwards following the introduction of the Minimum Funding Requirement which increased pension fund demand for gilts. Higher demand combined with lower supply resulted in downward pressure on yields. This influence was acknowledged by Ofgem (2004a) amongst others. [8]

Since Ofgem published its Final Proposals for DPCR in 2004, yields on UK gilts continued to fall, before increasing slightly over the past couple of months. This is shown in Figure 2.1.

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[6]   We note that Ofgem (2006) report that a risk-free rate of 2.75% was used at DPCR 2004, Ofgem (2004b) stated that the top of the range of the cost of equity presented in Ofgem (2004a) was used. The top of this range is consistent with a real risk-free rate of 3.00%.

[7]   Ofgem (2004a) reported that the CC range was taken from Competition Commission (2003) "Vodafone, O2, Orange and T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks." and Competition Commission (2002) "BAA plc: A report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd)."

[8]   *"At present, the UK yield curve is still slightly downward sloping at longer maturities. This has been attributed to institutional factors such as the minimum funding requirement (MFR) for pension funds and the health of public finances (resulting in low supply of government bonds)."* and *"There are several other reasons why many pension funds might have been limiting their equity exposure in the last few years, such as equity volatility, maturing funds and/or changes in accounting standards (FRS17 etc). Part of this move away from equity might have been into corporate bonds rather than gilts. It has also been argued that pension funds might switch to longer-duration securities to match the interest rate risk of their liabilities. All these factors will affect the demand for gilts (albeit to different degrees) and hence might continue the downward pressure on interest rates."* Ofgem (2004a), p12.

Figure 2.1
**Medium Term (Medium Term Maturity over Measurement Period) UK Index-
Linked Gilts, Monthly Average Mid Yields to Maturity.**
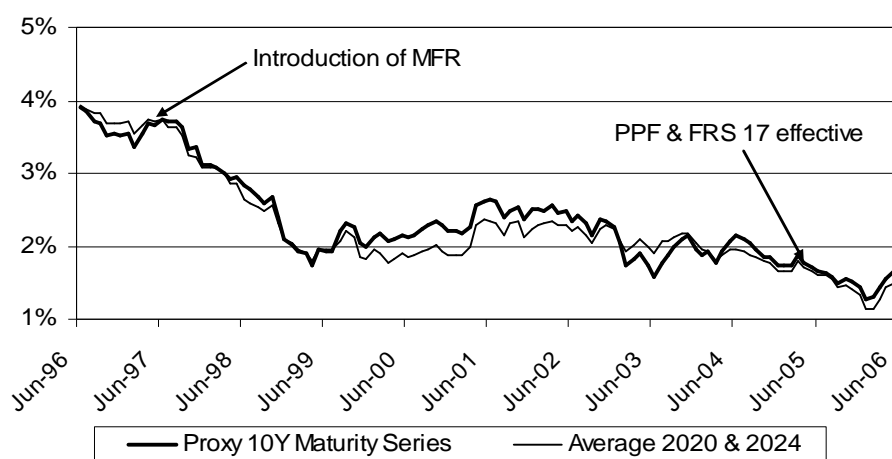
*Source: NERA analysis of Bloomberg data. Proxy 10Y maturity series calculated as yield of UK gilt
with maturity closest to ten years at point of measurement. Due to maturity distribution of UK gilt
issues, this series does not represent a constant exact 10Y maturity.*

The Figure shows that yields on UK gilts have fallen from around 4% in June 1996 to a
trough of just above 1% in February 2006, before increasing to around 1.7% at present. The
marked fall in yields from mid 1997 is attributed to the introduction of the Minimum Funding
Requirement (MFR). More recent falls from 2004/05 onwards have been attributed to the
effects of accounting standard FRS17 and the Pension Protection Fund (PPF) which were
introduced formally in 2005, replacing the MFR.

The impact of the MFR is clearly shown in the Figure. The period between 1997 and 2000 is
characterised by a dramatic decline in yields. The "artificial" depression of yields arising
from the MFR was widely acknowledged by market practitioners, regulators and academics.
The Bank of England stated that:

> *"The Minimum Funding Requirement led to strong institutional demand for ILGs. The
> combination of strong and rather price-insensitive demand (largely from pension funds)
> with limited supply has pushed real yields down, perhaps more than in the conventional
> gilt market. Consequently, real yields in the ILG market may not be a good guide to the
> real yields prevailing in the economy at large."* [9]

A Bank of England study conducted in 2000 found that the depression of gilt yields arising
from the MFR and reduced supply since 1997 was in the region of 0.2 to 0.3%. [10] However,
the report recognised that this figure was likely to be an underestimate. UK regulators have
also noted the bias to yields and some cases taken this into account in determining the risk-
free rate. For example, the Competition Commission stated in 2003 that: *"There appears to
be widespread recognition that gilt yields have been affected by special factors, including an*

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[9]   Bank of England (May 1999) Quarterly Bulletin.

[10] Brooke, Clare and Lekkos (2000) "*A Comparison of Long Bond Yields in the United Kingdom, the United States, and
      Germany*", Bank of England Quarterly Bulletin, May 200, p157.

increased demand from pension funds as a result of the introduction of the minimum funding requirements (MFR) in 1997, just before the decline in gilt yields started. The strong demand has placed upward pressure on prices of both conventional and index-linked Government securities. Between 1998 and 2000, the spread between yields on corporate bonds and on conventional gilts widened, supporting the contention that specific institutional factors had reduced gilt yields."[11]

There is clear evidence that the impact of the MFR over the period following 1997 resulted in a significant bias to UK ILG yields. The ten year period used by Ofgem contains a significant period where yields were artificially depressed by the MFR.

Since the phasing out of the MFR and the formal introduction of the PPF and FRS17 in early 2005, yields have fallen further to historical lows in February 2006, before recovering slightly recently. As set out in NERA (2006a), these further falls have been widely attributed to the FRS17 and PPF which have encouraged funds to hold gilts.

The key characteristic of the FRS17 (implemented in full in mid 2005) which has been held responsible for the dramatic declines in yields seen in early 2006 is the requirement that companies express their pension schemes as surpluses/deficits on profit and loss accounts. This, it has been argued, encourages pension funds to match assets with liabilities. Given that liabilities are generally long-dated and inflation-linked, demand for long-dated index-linked assets by pension funds is high. As reported in the Financial Times earlier this year, this results in further declines in yields and increases in demand:

> *"Demand is being fuelled in part by company pension funds trying to match assets with their liabilities to current and future pensioners. However, pension fund deficits are calculated using long-dated bond yields so, as real yields fall, deficits grow larger. Pension funds are thus forced to buy more bonds, creating a vicious cycle. The yield on the 50-year linked has fallen dramatically in recent trading sessions. Last week, a surge of demand sent its real yield to a record low of 0.38 percent."[12]*

The levy charged to pension plans by the recently established Pension Protection Fund has also, it as been argued, encouraged long dated gilt holdings by rewarding pension plans that invest in low-risk securities such as government bonds.[13]

The result of these (and other) impacts has been to reduce yields to the all time historical lows seen earlier this year:

> *"In the 300 years since the government first issued bonds, the average yield – adjusted for an estimate of expected future inflation that would plausibly have been made at the*

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[11] Competition Commission (2003) "Vodafone, O2, Orange and T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks."

[12] Financial Times (25 January 2006) "Yields on 50-year gilts hit auction low *Prices fail to deter strong demand by pension funds *Calls to increase supply of long-dated bonds."

[13] See for example The Wall Street Journal Europe (20 January 2006) *"Low yields in UK draw concern"* for a discussion of the impact of the PPF.

*time – has been very close to 3 per cent. Rarely have expected real yields fallen under 1
per cent. Almost never have expected real yields fallen under 0.5 per cent".* [14]

A second factor believed to have placed downward pressure on yields, particularly between
1997 and 2002, is low levels of supply. Evidence on net gilt issuance presented by the DMO
implies that the supply of gilts contracted by over 13% over the 4 years to 2002.[15] Supply
has recently increased significantly but demand continues to outstrip supply.[16]

A third factor to explain the fall in gilt yields in the period following 1997 is the increased
average level of market volatility that was observed over the period 1997 to 2004.[17] The
impact of increased market volatility on the yields of UK index-linked gilts was clearly
documented in Bank of England Reports since 1997.[18]

More recently, the easing of yields has been attributed by market commentators to a
statement by the Pension Regulator which sought to reduce the pressure on Funds to purchase
gilts.[19] However, and despite recent issues of gilts, it is widely recognised that pension fund
demands continue to exceed supply, distorting yields. [20] Whilst biases to yields arising from
pension fund demand are currently more focused on longer dated gilts, the MFR applied to
ten year bonds as well as longer-dated bonds, and high demand for longer dated gilts will
push other (non pension-fund) demand into shorter maturities.[21]

In conclusion, Ofgem's use of a ten year average gilt yield will result in a downwardly biased
estimate of the risk-free rate, as yields have been distorted by institutional factors for the vast
majority of the ten year measurement period (since mid 1996).

Evidence indicates that UK ILG yields were significantly downwardly biased between 1997
and 2002 to 2003 by the introduction of the MFR in 1997, and additionally depressed by
supply side restrictions and increases in average market volatility.

The impact of the full implementation of the FRS17 (and the Pension Protection Fund levies)
appears to have fuelled the most substantial declines in real yields yet, to a 300 year low
earlier this year. Easing of yields since then do not signal the removal of the downward bias
to yields, as pension fund demand continues to outstrip supply.

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[14] Financial Times (24 January 2006) *"Make the most of low bond yields"*. Recent yields on the 50 year index-linked gilt
have improved to over 1%.

[15] Source for calculation: DMO (2002) "Annual Review 2001-02", p11-15.

[16] Financial Times (25 January 2006) *"Yields on 50-year gilts hit auction low – prices fail to deter strong demand by
pension funds – calls to increase supply of long-dated bonds"* and Reuters News (11 May 2006) *"Britain's new 40-year
gilts lapped up in solid state"*.

[17] It should be noted that recent measures of implied volatility have fallen significantly (although very recent measures
(June 2006) have shown increases); this factor is therefore less relevant in explaining recent low yields.

[18] Bank of England (Feb 2003), Inflation Report, p5.

[19] Financial Times (10 May 2006) "Pressure ever increasing for UK's DMO".

[20] Dow Jones International News (20 April 2006) "*OECD Measures Pension Fund Demand for Long-Term Bonds*".

[21] This is evidenced by the close co-movement of yields on the 2020, 2024 and 10Y maturity bonds shown in Figure 2.1.

The effect of these distortions is to set returns on the affected range of bonds below the risk-free rate by the amount that pension funds are willing to pay to meet their legal obligations. UK ILGs therefore no longer serve as a measure of the risk-free rate for use in estimating the cost of equity. Preliminary analysis of the most recent historical evidence on yields on Eurozone index-linked government bonds gives a risk-free rate in the region of 2.5%, indicating that an estimate of the risk-free rate unbiased by UK pension law would be higher than Ofgem's estimate..

3.   Beta

Ofgem propose an equity beta of 0.9 for the transmission companies. Assuming 60% gearing, this figure is equivalent to an asset beta of 0.36. The beta methodology used by Ofgem at TPCR is not set out – but the beta is the same as used in NGC's 2000 review. This beta was based on a range of evidence including regulatory precedent, empirical analysis (mainly betas for comparators measured over five years) and assumptions about NGC's risk relative to the PESs; but no clear methodology was defined.

The equity beta with a value of one used at DPCR 2004 was apparently also based on a range of evidence and was not explicitly derived. Ofgem (2004b) concluded that there was significant uncertainty around observed beta estimates for the DNOs and assumed an equity beta of one, which is equivalent to an asset beta of 0.43 for the assumed gearing of 57.5%.

There are some advantages in fixing parameters at consensus levels, but Ofgem's use of a value of beta that is outdated (based on NGC 2000) and was not objectively derived in the first place undermines the robustness of the method. Transparency requires that Ofgem update the estimates of beta, set out any concerns regarding uncertainty and adjust the estimate accordingly, using alternative approaches where they would be informative (e.g. by comparing DGM estimates with CAPM estimates).

Preliminary analysis of five years historical evidence for NG indicates an asset beta of 0.36. However, this value does not allow for the occasional "de-coupling" of utility equity prices from the market index around one-off events such as regulatory reviews. As a proxy mitigation of these effects we looked i) at the ten year average asset beta for NG and ii) at the average asset beta for NG implied by our DGM analysis. *Both* the ten year asset beta *and* the average asset beta implied by five years' historical evidence on DGM estimates of the cost of capital indicate that NG's asset beta is 0.43.

Recent European regulatory precedent on gas transmission asset betas under price-cap regimes (or similar) is broadly consistent with an asset beta of 0.4 – the AEEG in Italy determined an asset beta of 0.38 for Snam Rete Gas in 2005 and in 2003 the CER (Ireland) allowed BGT an asset beta of 0.40.

In conclusion, our initial view on the asset beta for the transmission companies is that it should be at least 0.4, based on direct and implied evidence on NG and recent regulatory precedent. Lower values are inconsistent with either historical evidence or other regulatory decisions on the cost of capital.

4.   Equity Risk Premium

Ofgem does not set out its methodology for deriving the ERP at TPCR 2006, but its estimate of 5.2% is significantly higher than the 4.75% reportedly used at DPCR 2004. The equity risk premium is not directly observable, and so must be estimated. The method used to estimate the ERP must be consistent with the use of long term evidence on the risk-free rate and other WACC parameters.

A number of sources of evidence on the equity risk premium are available and they give a wide range of estimates. Some judgement is inevitably required to select and interpret evidence. However, to avoid undue regulatory risk or opportunism by minimising the scope of regulatory discretion, estimates of the equity risk premium should ideally use widely recognised sources of evidence and fall within a consensus range.

Preliminary analysis indicates that Ofgem's estimate of 5.2% is supported by recent evidence on the equity risk premium for the UK, based on our preferred approach of using very long-run returns evidence on the equity market. Dimson, Marsh and Staunton (2005) report the average arithmetic return on equity in the UK over bonds for 1900-2004 to be 5.2%, the same as Ofgem's estimate.[22]

Ofgem's estimate is broadly consistent with Ofwat's implied ERP of 5% used at the 2004 water price review and with Ofcom's use of 5% in various price reviews in 2004. Ofgem's estimate is at the upper end of other UK precedent, including the Competition Commission which has recently used estimates of 3.5%. With regard to wider European regulatory precedent, Ofgem's estimate of 5.2% is the same as the average ERP used over the past five years, as shown in Table 4.1.

Table 4.1
Recent Decisions on the ERP by European Regulators

Regulator	Country	Year	Company/Industry	ERP
DTe	Netherlands	2001	Gas Distribution	5.5%
CER	Ireland	2001	ESB Transmission	5.4%
CAR	Ireland	2001	Aer Rianta	6.0%
Oftel	UK	2001	BT	5.0%
CER	Ireland	2003	BGT	5.0%
DTe	Netherlands	2003	TenneT	5.5%
ODTR	Ireland	2003	Telecoms	7.0%
CC	UK	2003	Vodafone, O2, Orange & T-Mobile	3.5%
Ofwat	UK	2004	Water companies	5.0%
CER	Ireland	2004	Best New Entrant Price 2005	5.3%
Ofcom	UK	2004	Various	5.0%
CAA	UK	2005	NATS	4.5%
AEEG	Italy	2005	Snam Rete Gas	4.0%
CER	Ireland	2005	ESB	5.3%
CAR	Ireland	2005	DAA	6.0%

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[22]   Dimson, Marsh and Staunton/ABN AMRO/LBS (2005) "Global Investment Returns Yearbook 2005".

In conclusion, Ofgem's failure to provide the basis for its estimate of the equity risk premium weakens the robustness of its methodology and the long-run predictability of returns. Using objectively verifiable estimates not only allows proper scrutiny of the approach, but also assures investors that future estimates will only change to reflect variation in market conditions, not changes in regulatory policy. However, the available evidence does support Ofgem's chosen value: evidence on long run returns on equity for the UK and recent regulatory precedent are both consistent with Ofgem's estimate of 5.2%.

5. Cost of Equity

5.1. Use of Long Run Returns to Estimate the Cost of Equity (Excluding Issuance Costs)

At both TPCR 2006 and DPCR 2004, Ofgem's view on the overall cost of equity appears to be guided by long run average arithmetic returns on the equity market as a whole, based on evidence presented by Smithers and Co.[23] Ofgem (2004b) stated that:

> *"Ofgem notes that the Smithers & Co report for the joint regulators group concludes that their 'central estimate of the cost of equity capital, derived from a wide range of markets, is around 5.5% (geometric average), and thus 6.5% to 7.5% (arithmetic average).' For these Final Proposals, given the investment focus of the review, Ofgem has adopted a post-tax real cost of equity figure of 7.5% for these Final Proposals. This is the top end of the range published in the March 2004 Policy Document…"[24]*

At TPCR 2006 Ofgem has selected the midpoint of the 6.5% to 7.5% range, stating that:

> *"we are currently undertaking a study which is examining these factors, and are currently using a total market return of 7.0%, based on evidence that the long term arithmetic average of total equity market returns is between 6.5% and 7.5%"[25]*

We have three key concerns regarding Ofgem's approach.

First, the figures quoted above are based on the assumption of an equity beta equal to one. In practice, regardless of whether this value was accurate or not, it cannot be used as an assumption without simultaneously specifying the gearing at which this equity beta applies (which is tantamount to specifying a fixed value for the asset beta). Hence, assuming an equity beta of one is not a robust methodology. In any case, the equity beta of one is inconsistent with Ofgem's stated assumption of an equity beta of 0.9 for transmission companies.

Second, the Smithers & Co calculation also uses a historical estimate of the ERP and a forward looking (but now outdated) estimate of the risk-free rate. Given the negative relationship between the ERP and the risk-free rate,[26] this approach is likely to understate the cost of equity. Around the publication date of the Smithers report (2003), high market volatility contributed to lowering yields on government bonds used to estimate the risk-free rate. (This temporary factor added to the 'artificial' downward pressure on yields, discussed elsewhere in this report and in NERA (2006a)).

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[23] Smithers and Co. (2003) "A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK", February 2003

[24] Ofgem (2004b), p106.

[25] Ofgem (2006), p31 (Appendix 9 – Financial Issues).

[26] As discussed in NERA (2006a).

Third, Ofgem does not explain or justify its decision to move from the DPCR 2004 assumption that the cost of equity is 7.5% (top of Smithers & Co.'s range of 6.5% to 7.5%) to the midpoint value of 7.0% at TPCR 2006. Ofgem does not present any evidence showing that the cost of equity for the market has fallen since 2004; this change in assumption therefore appears arbitrary and the resulting estimate of the cost of equity lacks a robust foundation.

5.2. DGM Estimates of the Cost of Equity

5.2.1. Ofgem's approach

Ofgem claims that it has undertaken DGM analysis of the cost of equity which is consistent with its estimate of 7.0%. However Ofgem does not report the results or methodology used, which prevents this claim or the underlying analysis from being checked.

As discussed in NERA (2004b), Ofgem's approach at DPCR contained a number of flaws which resulted in its DGM estimates underestimating the cost of equity for UK DNOs. These flaws are summarised below:

§ Ofgem incorrectly used a *historical* measure of the dividend yield, instead of a *prospective* dividend yield. This led to a downward bias in the estimated cost of equity.

§ Second, Ofgem assumed that real dividend growth for the DNOs would only match load growth. NERA (2004b) presented a number of reasons why Ofgem's approach would underestimate long term dividend growth for the DNOs.

§ Third, Ofgem did not adjust the estimated cost of equity to make it consistent with the notional gearing assumption used in calculating the WACC. This methodological error meant that Ofgem's estimates underestimated the cost of equity.

§ Fourth, Ofgem used a "spot" estimate of the DGM, which contradicted its use of long run time series data evidence on the cost of equity. Several NERA reports have stressed the need to use time-series evidence to estimate the cost of capital.[27]

As stated, Ofgem (2006) does not set out the methodology used in deriving its DGM estimates; we therefore cannot verify whether any of the above errors have been repeated in estimating the DGM cost of equity for the transmission companies.

Ofgem (2006) also makes an error in interpreting the influence of price control reviews on DGM estimates by stating that:

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[27] See for example NERA (2006a) "Applying the CAPM – The Case for Long Term Time Series Data. Issue Paper 1 for EDF Energy Plc", April 2006.

> *"However DGM uses forward looking dividend growth estimates which may themselves be based on expectations regarding the outcome of a price control review and this would result in a circularity of logic in the calculation. For these reasons, economic regulators in the UK have tended to use the DGM as a check on, rather than a substitute for, the CAPM."*[28]

It is irrelevant whether expected growth forecasts are influenced by the price control review or not. The price of a share under the DGM is determined by the discount rate and dividend growth *expected by the market*. It follows that any calculation intended to "back-out" the discount rate has to use the dividend growth rate expected by the market. What influences expectations is irrelevant, so long as the assumed rate of dividend growth accurately represents market expectations.[29]

5.2.2.   NERA estimates of the DGM cost of equity for transmission companies

The accompanying report (NERA (2006d)) sets out our DGM analysis of the cost of equity for the transmission companies.

Our estimates are based on the following principles:

§   **Use of a two-step DGM** which incorporates short-term analyst forecasts for years 1 to 4/5 and long term expectations of GDP growth thereafter;

§   **NG (National Grid) as our primary source of evidence on the DGM cost of equity.** Estimates of the re-levered DGM cost of equity for SSE and SP are significantly higher than for NG, owing to the higher proportion of more risky activities undertaken, such as generation and retail. The cost of equity for these companies may therefore overstate the cost of equity for transmission activities.

§   **A gearing assumption of 60%.** We "re-lever" our observed DGM cost of equity for Ofgem's notional gearing assumption of 60%.

§   **Estimates are based on five years of historical evidence.** Our concluding estimate of the DGM cost of equity is based on estimates made over the period 2001-06, consistent with our recommendation in NERA (2006a) in favour of using long term time series data

Our estimates of the cost of equity for National Grid (NG, owner of NGG and NGET), Southern and Scottish Electric (SSE, owner of SHETL) and Scottish Power (SP, owner of SPTL) are set out in Table 5.1.

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[28]   Ofgem (2006), p29.

[29]   Of the CAPM and DGM, the CAPM-based cost of equity is more likely to be distorted by investor behaviour around price control reviews. NERA has discussed "decoupling" of utility stock betas around regulatory events in a number of papers, such as NERA's 2004 report for EdF, "UK Electricity Distribution Cost of Capital". The DGM is therefore potentially a highly valuable additional source of evidence on utility stock betas during the price control review process.

Table 5.1
Estimates of the Real Cost of Equity for NG, SSE and SP

	NG	SSE	SP	Average
FY 2001	5.6%	7.8%	8.2%	**7.2%**
FY 2002	6.1%	8.1%	8.5%	**7.6%**
FY 2003	7.3%	8.9%	7.4%	**7.9%**
FY 2004	8.1%	7.9%	8.6%	**8.2%**
FY 2005	7.6%	7.2%	8.5%	**7.8%**
FY 2006	7.1%	7.2%	7.2%	**7.2%**
Average	**7.0%**	**7.9%**	**8.1%**	**7.6%**

The Table shows that the average cost of equity for NG, SSE and SP has risen from 7.2% in 2001 to a peak of 8.2% in 2004 before falling back to 7.2% in 2006. Evidence presented in NERA (2006d) shows that the movement in the cost of equity and gearing levels for each company are positively related, as predicted by standard finance theory.

Table 5.1 shows the average cost of equity over the period for NG, our primary source of evidence on the cost of equity for the transmission companies, as 7.0%, the same as Ofgem's estimate. However, the estimates in Table 5.1 are consistent with companies' actual gearing levels over the period and not with Ofgem's assumption of notional 60% gearing. These results are not therefore directly relevant to the cost of equity that Ofgem should be estimating for its calculation of the WACC.

Table 5.2 sets out estimates of the real cost of equity for NG, SSE and SP, "re-levered" for Ofgem's proposed notional gearing assumption of 60% at TPCR 2006. Details of the methodology used to re-lever the DGM cost of equity estimates are set out in NERA (2006d).

Table 5.2
Estimates of the Real Cost of Equity for NG, SSE and SP Based on DGM, Adjusted for 60% Gearing

	NG	SSE	SP	Average CoE
FY 2001	7.3%	12.6%	10.9%	**10.3%**
FY 2002	6.9%	13.6%	9.9%	**10.1%**
FY 2003	7.9%	14.6%	9.5%	**10.7%**
FY 2004	9.5%	13.2%	11.3%	**11.3%**
FY 2005	9.1%	12.2%	10.9%	**10.7%**
FY 2006	8.7%	12.1%	11.2%	**10.7%**
Average	**8.2%**	**13.1%**	**10.6%**	**10.6%**

The Table shows that the average re-levered estimate of the cost of equity for NG, SSE and SP over the period 2001-06 is 10.6%. However, as stated above, the cost of equity for SSE and SP may overstate the cost of equity for transmission activities owing to reliance on other activities such as generation and retail. We conclude that a more accurate measure of the cost of equity for regulated transmission companies would use the figure for NG, namely 8.2% (before issuance costs), as the real post-tax cost of equity.

As mentioned above, we estimated the cost of issuing equity in 2004 to be 0.3%. Adding this to our DGM cost of equity estimate of 8.2% gives a cost of equity of 8.5% (Table 5.3).

Table 5.3
NERA Real Post-Tax Cost of Equity Estimates for UK Transmission Companies

	NERA DGM	Ofgem Initial Proposals
Gearing	60%	60%
Real post-tax cost of equity (excluding issuance costs)	**8.2%**	**7.0%**
Issuance Costs	0.3%	-
Real post tax cost of equity (including new issuance costs)	**8.5%**	**7.0%**

Source: NERA analysis of Bloomberg and IBES data.

The Table shows our estimate of the cost of equity as 8.5%, including issuance costs. This is significantly higher than Ofgem's initial estimate of 7.0% for the transmission companies but it is consistent with our initial estimate of the CAPM cost of equity presented in the following section.

5.3. NERA Initial Estimates of the CAPM Cost of Equity for the Transmission Companies

Table 5.4 sets out our initial estimates of the CAPM cost of equity for the transmission companies, alongside Ofgem's initial proposals.

Table 5.4
Cost of Equity Estimates for the Transmission Companies, NERA vs Ofgem

	NERA	Ofgem (2006)
Risk-free rate	2.5%	2.3%
Gearing (D/(D+E))	60%	60%
D/E	150%	150%
Asset beta	0.40	0.36
Equity beta	1.00	0.90
Equity risk premium	5.2%	5.2%
Real post-tax cost of equity before issuance costs	**7.7%**	**7.0%**
Equity issuance costs	0.3%	-
Real post-tax cost of equity after issuance costs	**8.0%**	**7.0%**

Source: NERA analysis of Bloomberg and IBES data. Note that NERA estimates are preliminary and should not be taken as our final conclusions on the cost of equity for the transmission companies.

The Table shows that our estimate of the cost of equity is 8.0%, one percentage point higher than Ofgem's estimate of 7.0%. This difference derives from (i) our preliminary assumption of 2.5% for the risk-free rate, compared to Ofgem's proposed estimate of 2.3%, (ii) our preliminary assumption of 0.40 for the asset beta, compared to Ofgem's proposed estimate of 0.36 and iii) our inclusion of equity issuance costs, which Ofgem omits from its estimate of the cost of equity.

Our CAPM estimate is consistent with our DGM evidence, which indicates a cost of equity of 8.5% including transactions costs. Our preliminary range for the cost of equity is therefore 8.0% to 8.5%, based on these two sources of evidence.

6. Cost of Debt

6.1. Cost of Debt (Excluding Issuance Costs)

Ofgem's 2006 estimate of the cost of debt is based on the sum of the risk-free rate and a debt premium. Ofgem estimates the debt premium using evidence on UK single A debt spreads over gilts. Ofgem's estimated debt premium for DPCR 2004 was based on a combination of spot and longer term evidence on yields for the DNOs. Ofgem did not set out its methodology for estimating the debt premium during its review of NGET in 2005.[30]

Ofgem has used consistent time-series data for the Risk-Free Rate and debt premium and using UK evidence is likely to reflect the cost of most debt actually incurred by the transmission companies.   Our concerns regarding the use of UK gilt yields to estimate the risk-free rate do not apply here, because artificially depressed gilt yields will be offset by artificially inflated corporate spreads over gilt yields. It would be more transparent to estimate the total cost of debt from evidence on yields and/or coupons, but Ofgem's approach is equivalent in principle to estimating the total cost.

Ofgem's reliance on UK evidence alone, when estimating the cost of debt, needs to be reviewed. Capex requirements and the corresponding need to issue debt (as set out in Ofgem 2006) are projected to be significant. The scale of supply may mean that the transmission companies have to raise debt in markets other than the UK, in order to ensure efficient financing. (If issuance in the UK market exceeds demand, it will drive up interest costs.) Evidence on outstanding debt already issued by NGET and National Grid Gas shows that 33% of issued debt is denominated in currencies other than sterling.[31] This indicates that the issuance of non-sterling debt alongside sterling debt is already an optimal financing strategy that would be likely to continue in the case of significant issuance requirements. Ofgem should therefore consider the need for assessing international evidence on debt costs alongside UK evidence, although we found no strong case for doing so.

Preliminary analysis indicates that Ofgem's estimate of a real cost of debt of 3.4% (excluding issuance costs) is reasonable. [32] Five year average yields for single A rated 15 year maturity Euro utility bonds are in the region of 3.2% in real terms. Preliminary analysis of single A rated Sterling corporate bonds at 15 years maturity shows that real yields have been 0.2% higher than Euro utility bonds since 2003.[33] Together these imply a cost of debt of 3.2% to 3.4% (excluding issuance costs). Actual coupon costs for National Grid issues have been significantly lower than Ofgem's estimate and its evidence on single A rated debt costs. The

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[30] Ofgem specified a debt premium of 1.7% at NGC 2000, based on a combination of spot and medium term historical evidence on NGC's actual debt costs and costs of debt at a BBB rating. However, the debt premium reported by Ofgem (2006) for NGET is 1.1%. Since Ofgem did not set out reasons for this difference at NGET 2005 we cannot compare the NGET 2005 methodology with TPCR 2006.

[31] Based on proportion of non-sterling denominated bonds in total issued amount of currently outstanding bonds for National Grid Electricity Transmission PLC, National Grid Gas Plc and NGG Finance Plc.

[32] We stress that this analysis and associated estimates are preliminary and should not be taken as our final conclusions on the cost of debt for the transmission companies.

[33] Based on a GBP corporate single A rated composite index compiled by Bloomberg for which data is only available from 2003. Further analysis of the cost of debt would involve construction of a constant maturity GBP single A corporate index over a five year historical period.

annual average real coupon for UK IL bonds issued by NGG and NGET since 2001 is 2.6% as shown below.

Table 6.1
Coupon Costs for NG UK IL Debt

Name	Issue Date	Maturity	Real Coupon (All Issue Prices = 100)
National Grid Electricity Transmission PLC	27/07/2001	27/07/2030	3.6
National Grid Electricity Transmission PLC	27/07/2001	27/07/2020	3.8
National Grid Electricity Transmission PLC	08/07/2002	08/07/2032	2.8
National Grid Electricity Transmission PLC	08/07/2002	08/07/2018	3.0
National Grid Electricity Transmission PLC	31/08/2005	28/08/2035	2.1
National Grid Electricity Transmission PLC	28/09/2005	28/09/2035	2.0
National Grid Electricity Transmission PLC	17/10/2005	17/10/2035	2.0
National Grid Electricity Transmission PLC	23/11/2005	23/11/2035	1.8
National Grid Electricity Transmission PLC	03/04/2006	03/04/2036	1.6
National Grid Gas Plc	07/04/2006	07/04/2036	1.7
National Grid Electricity Transmission PLC	07/04/2006	07/04/2036	1.7
National Grid Electricity Transmission PLC	11/05/2006	11/05/2056	1.8
National Grid Electricity Transmission PLC	26/05/2006	26/05/2056	1.8
National Grid Gas Plc	28/06/2006	28/06/2046	1.7
Average 2001			**3.7%**
Average 2002			**2.9%**
Average 2005			**2.0%**
Average 2006			**1.7%**
Average			**2.6%**

Source: Bloomberg

On the basis of evidence on Euro and Sterling denominated single A bond yields, our preliminary conclusion is that Ofgem's estimate of 3.4% (excluding issuance costs) is reasonable.

Ofgem's only error in calculating the cost of debt is a failure to include the cost of issuing new debt. Investors must be compensated for issuance costs, like any other, in order to ensure that a company can efficiently issue new debt and attract new equity. Analysis undertaken in 2004 by NERA indicates that debt issuance costs are typically around 0.10% to 0.15%. Our preliminary view is to include the top of this range, given the scale of new debt issuance requirements indicated by Ofgem (2006).

Our preliminary view on the cost of debt is 3.6%, including issuance costs.

7. Initial View on the Cost of Capital for Transmission Companies

Table 7.1 sets out our initial view on the cost of capital for the UK transmission companies, based on discussion and analysis presented within this report. We present two estimates; the first based on the cost of equity of 8.0% derived from preliminary CAPM analysis and the second based on the cost of equity derived using DGM analysis.

Table 7.1
Cost of Capital Estimates for the Transmission Companies, NERA vs Ofgem

	NERA (CAPM CoE)	NERA (DGM CoE)	Ofgem (2006)
Tax rate	30%	30%	30%
Risk-free rate	2.5%	2.5%	2.3%
Gearing (D/(D+E))	60%	60%	60%
D/E	150%	150%	150%
Cost of equity			
Asset beta	0.40	-	0.36
Equity beta	1.00	-	0.90
Equity risk premium	5.2%	-	5.2%
Real post-tax cost of equity before issuance costs	**7.7%**	**8.2%**	**7.0%**
Equity issuance costs	0.3%	0.3%	-
Real post-tax cost of equity after issuance costs	**8.0%**	**8.5%**	**7.0%**
Cost of debt			
Debt premium	-	-	
Real cost of debt before issuance costs	**3.4%**	**3.4%**	**3.4%**
Debt issuance costs	0.2%	0.2%	-
Real cost of debt after issuance costs	**3.6%**	**3.6%**	**3.4%**
Cost of capital			
Real pre-tax WACC	**6.7%**	**7.0%**	**6.0%**
Real post-tax WACC net of debt tax shield	**4.7%**	**4.9%**	**4.2%**

Source: NERA analysis of Bloomberg and IBES data. Note that NERA estimates are preliminary and should not be taken as our final conclusions on the cost of capital for the transmission companies.

Our preliminary concluding range of the cost of capital for the transmission companies is 4.7% to 4.9%. This is significantly higher than Ofgem's initial proposal of 4.2%.

8. Financeability and Issuance Costs

Ofgem (2006) appears to propose that all new capex will be financed from internal resources (retained earnings), new equity and debt, whilst maintaining a constant capital structure. Ofgem also states that it will address the financeability shortfall arising from the loss of income due to cessation of regulatory depreciation on pre-vesting assets via a tilted depreciation approach. The method of modelling this solution does not appear to be addressed explicitly in Ofgem (2006),[34] although Ofgem does state that "*it was indicated that this modelling would also take into account any wider financeability issues.*"

8.1. Comments on Ofgem Approach

Our comments on Ofgem's overall approach are as follows.

Ofgem's modelling of projected financial ratios

Ofgem's financial projections regarding the financing of new capex (p33, Ofgem (2006)) show that the proposed financing of new capex using internal resources, new equity and debt will result in financial ratios that exceed Ofgem's identified target/threshold ratios. The ratios specified are significantly lower than those specified at DPCR 2004 and are also lower than those identified by NERA (2004c) as consistent with a single A credit rating. The various results and the appropriate standards are shown in Table 8.1.

Table 8.1
Ofgem (2006) Threshold Credit Ratings and Evidence from S&P (based on NERA (2004a))

	Ofgem (2006)	Ofgem (2004a)	NERA (2004c)
FFO/Interest	>2.0x	>3.0x	3.0x – 5.0x
FFO/Debt	>10%	-	13% - 25%
Net debt/RAV	<68%	<65%	40% - 60%

The Table shows that the ratios specified by Ofgem (2006) are significantly lower than the ratios that Ofgem indicated as suitable at DPCR 2004 and are much lower than the ratios presented in NERA (2004c) as consistent with a single A credit rating. Since Ofgem proposes to base the cost of debt on an assumed credit rating of single A, its modelling of financeability should also use financial ratios consistent with a single A credit rating. On the basis of evidence presented by NERA and Ofgem in 2004, it appears that Ofgem's proposed ratios for TPCR 2006 are lower than those consistent with a single A credit rating. Applying the ratios indicated in 2004 indicates that the threshold for single A credit ratings will be breached by all companies except SPTL over the price control period. That means that either the NGET and SHETL will be unable to raise finance on the terms predicted by Ofgem, or that the cost of capital is higher than Ofgem estimates.

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[34] Ofgem (2006) states that its initial view is that this adjustment will be achieved by reducing the life of post-vesting assets from 40 years to 25 years (with 20 years for smoothing) for NG and SPTL and from 48 years to 40 years (with 15 years for smoothing for SHETL).

Funding of new capex with equity and debt

Ofgem assumes that new capex not funded by internal resources will be funded by debt and equity in a way that maintains a constant capital structure. This approach is the only one that is potentially consistent and transparent from one review to the next. However it is only viable if several key criteria are met.

Firstly, the cost of capital must include sufficient allowance for the cost of issuing new equity and debt. Ofgem (2006) fails to include these issuance costs. NERA analysis undertaken in 2004 showed that equity issuance costs were in the region of 0.3%[35] and debt issuance costs around 0.10% to 0.15%.[36]

Secondly, financial ratio projections must not only satisfy debt related ratios but minimum levels of target equity indicators as well. A number of ratios such as dividend growth, cover and cash-flow are important to equity investors. The recent Water UK Investor Survey (2005) presented evidence showing that the three most important indicators considered by equity investors when making investment decisions are dividend growth, dividend yield and dividend cover. Ofgem (2006) has not modelled any of these indicators in setting out new equity and debt issuance requirements.

Thirdly, Ofgem must assess the capacity of debt and equity markets to provide finance to the transmission companies – their projected new capex is significant and companies may have to turn to international markets to raise funds most efficiently. As discussed in Section 6, NG already accesses international markets for debt finance and is likely to continue doing so in the next price control period. The allowance for the cost of capital must take account of additional costs or premia on rates of return/interest costs relative to the UK market associated with raising finance from non-UK markets.

Use of tilted depreciation in ensuring financeability

Ofgem (2006) proposes to use "tilted" depreciation to deal with the depreciation cliff edge which will result in financeability shortfalls. Ofgem has not presented further details of its proposed modelling in this regard, so we restrict our comments on this approach to high-level views on the principle of using tilted depreciation as a mechanism for addressing financeability shortfalls.

As discussed in NERA (2006c), Ofgem has used the acceleration of depreciation in the past to solve short term financeability issues. This approach simply postpones the problem to a future period. Unless it is certain that financeability constraints will lessen in the foreseeable figure, accelerating depreciation allowances may require further and more severe financeability adjustments in the future.

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[35]   Previous reports written by NERA for the UK water sector and electricity sector estimated an equity issuance costs premium of 0.3%, based on the "conventional approach" used to account for flotation costs in US regulatory proceedings. This approach is based on a company/sector-specific formula (taking into account dividend forecasts, required cost of equity and other factors) which is cited in corporate finance textbooks such as Brigham and Gapenski (1991) and Morin (1994). See NERA (2004) "UK Electricity Distribution Cost of Capital: A Report for EdF."

[36]   See NERA (2004) "UK Electricity Distribution Cost of Capital: A Report for EdF."

The alternative to accelerating depreciation (a cost) is to advance the collection of revenues (without adjusting costs). However, any revenue advance mechanism simply represents a loan from customers. The additional revenue should not be booked as revenue, and hence a contribution to profit. Instead, the additional inflow of funds from customers represents loan that should be recorded as incoming cashflow and will be offset by a growing liability (the obligation to repay the loan as lower revenues in the future). Such an option can only provide an effective boost to financeability, if the financial markets don't notice the off-balance-sheet liability, which may be true in the short term but unlikely to be true in the long term.

8.2. Summary

Despite lowering the bar, by reducing the standards companies have to meet for a given credit rating, Ofgem has still found it difficult to provide the necessary assurance that the transmission companies can finance their activities over the coming regulatory period. This deficiency in the proposals is a serious one, given Ofgem's legal duties.

Ofgem has investigated a number of ways to shift cashflow into the next regulatory period, but all represent effectively loans from future customers, which must be paid back in the form of lower cashflows at some future date. It is unclear whether these temporary manipulations of cashflow will be enough to satisfy investors.

These problems derive in part from the level and form of depreciation adopted in previous regulatory reviews, which Ofgem can now do little to change. However, in part, the problem is likely to stem from Ofgem's underestimate of the cost of capital, as indicated by previous sections. Ofgem still has the power to make a difference by correcting the errors and biases in this part of its current proposals.

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