

**OFGEM'S INITIAL PROPOSALS FOR
THE COST OF CAPITAL IN THE
DNO PRICE CONTROL REVIEW:
A COMMENTARY**

A Report for EDF Energy

Prepared by NERA

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1. INTRODUCTION

1.1. EDF Energy has commissioned NERA to provide a commentary on Ofgem's proposals set out in recent Ofgem consultation documents regarding estimation of the cost of capital for the UK electricity distribution network operators (DNOs) for the 2005 price review.

1.2. Ofgem's July 2003 consultation paper¹ on updating price controls sets out Ofgem's "main thoughts" on the cost of capital with respect to the methodology that they will use to estimate the cost of capital for the DNOs at the 2005 price control review. These thoughts can be summarised as follows:²

- **Use of CAPM:** Ofgem says it will "*continue to use CAPM to estimate the cost of equity*" and that they will also look at the "*aggregate return on equity alongside the traditional building block approach*".
- **Forward-Looking Evidence:** Ofgem says "*estimates of the various components of the cost of capital should be based on forward-looking data as this provides the most robust estimate of future rates*".
- **Gearing and Credit Ratings:** Ofgem sets out its intention "*to use a level of gearing that is consistent with companies maintaining a credit rating that is comfortably within the investment grade category*".
- **Tax:** Ofgem states that, where expected (tax) liabilities differ from formulaic allowances, "*for reasons other than company efficiency or temporary timing differences which are expected to reverse it may be appropriate to use company specific allowances for tax liabilities*", such allowances to be determined through financial modelling.
- **Embedded Debt.** Ofgem says "*in view of the recent stable level of interest rates, it is not minded to provide additional allowances for embedded debt*".

1.3. This paper is structured around comments on each of these general methodological issues:

- Section 2 discusses theoretical and empirical issues regarding the use of CAPM and its alternatives;

¹ Ofgem (July 2003) "*Electricity Distribution Price Control Review: Initial Consultation*".

² Ofgem (July 2003) "*Electricity Distribution Price Control Review: Initial Consultation*", para 7.8.

- Section 3 discusses the use of forward looking estimates versus historical data in the calculation of the CAPM;
 - Section 4 discusses capital structure, gearing and credit ratings in relation to the ability of DNOs to raise debt finance;
 - Section 5 discusses Ofgem's approach to taxation and the incentive properties of a company specific approach to taxation;
 - Section 6 comments on Ofgem's proposed treatment of embedded debt; and
 - Section 7 summarises our recommendations.
- 1.4. Appendix A provides a more technical discussion of some of the issues involved in estimating betas for UK electricity companies at the current time.

2. CAPM METHODOLOGY AND ALTERNATIVES

'Traditional CAPM' and the Aggregate Return on Equity

- 2.1. The CAPM is the most widely used method for calculating the cost of equity for UK regulated utilities. Under the CAPM, the cost of equity can be set out as:

$$E[r_e] = E[r_f] + b(E[r_m] - E[r_f]) \quad (1)$$

where: $E[r_e]$ is the expected return on equity; $E[r_f]$ is the expected return on a risk-free asset; $E[r_m]$ is the expected rate of return for the market (and thus $E[r_m] - E[r_f]$ is the expected risk premium); and b is a measure of the systematic riskiness of the equity, the "equity beta".

- 2.2. Following the report by Smithers and Co (2003), Ofgem suggests there may be merit in considering the "*aggregate return on equity alongside the traditional building blocks approach*". This phrase refers to Smithers and Co's "reformulation" of the CAPM, such that estimates of the cost of equity are derived from estimates of the aggregate market return and the risk-free rate (rather than as the sum of the risk-free rate and the equity risk premium) separately, as follows:

$$E[r_e] = E[r_f][1 - b] + \beta(E[r_m]) \quad (2)$$

- 2.3. Since regulated utilities are likely to have a beta close to one, Smithers and Co argue that equation (2) is a preferred model to equation (1) since the estimated cost of equity is not very sensitive to the estimated risk-free rate under equation (2). Smithers and Co argue that equation (2) may therefore be a more efficient way to estimate the cost of equity for regulated utilities because "*there is more uncertainty about the true historic risk free rate, and hence the equity risk premium, than there is about the market return itself*".³ Smithers and Co argue that the historical evidence on the risk-free rate (and hence the equity risk premium) is unstable and attribute this instability to factors such as major errors in (under-)estimating inflation that have caused real returns on bonds to be lower than expected.

- 2.4. We comment on these approaches and arguments below.

³ Smithers and Co (2003), "A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK", February 2003, p4.

NERA Comments on CAPM Methodology

- 2.5. Two key problems with the CAPM methodology applied by Ofgem in recent energy price reviews concern the *transparency* and *internal consistency* of its decisions.
- 2.6. Cost of capital estimation methods in the UK now follow a reasonably standard format, based around the calculation of a Weighted Average Cost of Capital and using CAPM to estimate the cost of equity. However, the absence of objective or agreed sources of information on some elements of the calculation gives any regulator the potential to “cherry pick” data sources, or to substitute arbitrary judgements. Recently, use of this discretion has led to a gradual decline in the cost of capital, which the DNOs have opposed with only limited success, even though Ofgem’s decisions have been out of line with objective data.
- 2.7. Ofgem’s estimates of the equity risk premium at recent price reviews have been particularly subjective and lacking in consistency with observed data. In the price reviews for DNOs (2000), NGC (2001) and BG TransCo (2002), Ofgem derived estimates of the equity risk premium around 3.5%, based on small sample surveys with selective interpretation of data:
- At the DNO price review in 2000, Ofgem referred to a survey of institutional investors published by CLSE in October 1998 that suggesting that, after adjusting for inflation, the ERP is in the range 2.7% to 4.5%.⁴ However: the survey did not ask investors for direct estimates of equity risk premium. In commenting on Ofwat’s use of the CLSE paper, Professors Cooper and Currie from the LBS suggested the ERP range *implied by the survey* could be “considerably higher” than this range.⁵
 - At the DNO price review in 2000, Ofgem referred to “a survey of equity analysts” by NERA⁶ published in January 1999 that “*suggests that the ERP is in the range 3 to 4 per cent*”. In fact, the survey contained only six analysts and the answers showed wide variation, implying that one should not rely heavily on such surveys.
- 2.8. Ofgem has continued to rely on survey evidence for estimating the equity risk premium in its recent decisions for NGC (2001) and BG TransCo (2001), even though

⁴ Credit Lyonnais Securities Europe (1998), “Risk and Return in the UK Water Sector: An Independent Survey of Institutional Investors”, Credit Lyonnais Securities, London, p15.

⁵ Cooper and Currie (1999) “The Cost of Capital for the UK Water Sector”, London Business School Regulation Initiative Discussion Paper Series, No. 28

⁶ NERA (1998) “Survey of Water Industry Cost of Capital and Risks Following Ofwat’s ‘Prospects for Prices’”

the Competition Commission noted in its reports on Mid Kent Water (2000) that “*this evidence may be subject to biases that are difficult to quantify and assess*”.⁷ The Competition Commission made similar comments in its recent report on BAA (2002).⁸

- 2.9. A second important criticism of the CAPM methodology, as applied by Ofgem and other UK regulators to estimate the cost of equity, concerns *internal consistency*. The risk-free rate and the costs of debt can both be measured at a single point in time. However, in practice, no objective and verifiable measure of the equity risk premium and beta exist at a single point in time; instead, these parameters are usually measured using historic time series.
- 2.10. Estimates of the WACC based on a mixture of current and historic data are internally inconsistent and fail to take account of strong empirical evidence showing that CAPM parameters and costs of debt are inversely correlated. In other words, in times of high market volatility, the equity risk premium rises to reflect higher required equity returns to compensate for the increased volatility, but at the same time yields on risk-free assets and the cost of strong corporate debt fall (as investors reallocate their portfolios out of investments perceived as risky and into government and corporate bonds). Unless regulators estimate cost of capital parameters using consistent datasets, they will fail to take account of these interrelationships and will introduce important biases into their overall estimate of the cost of equity.
- 2.11. Applications of CAPM at recent Ofgem price reviews have not demonstrated any recognition of the need for cost of capital estimates to be internally consistent and therefore based on consistent datasets. In justifying estimates of various parameters, Ofgem has referred to a variety of evidence including dated survey evidence, regulatory precedent and current market data. Ofgem has generally adopted estimates of each parameter at the lower end of the plausible ranges and has not taken into account the trade-offs between parameters or the need for internal consistency in the overall estimate of the cost of equity.
- 2.12. To avoid these unnecessary biases, we recommend that Ofgem calculate all elements of the CAPM formula as the long-term average of a historical time series, even if point estimates are available (e.g. for the risk-free rate). The method of deriving estimates from time series should ideally be reproducible in future price control reviews.

⁷ Competition Commission (2000a) “Mid-Kent Water Plc: A Report on the References under Sections 12 and 14 of the Water Industry Act 1991”, para 8.28.

⁸ 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)”.

NERA Comments on Smithers and Co “Aggregate Return on Equity Methodology”

- 2.13. Ofgem states that it will also consider the aggregate return on equity alongside the traditional building blocks approach, as a benchmark for the cost of equity of DNOs. However, given adherence to two different methods, there is a risk that Ofgem will assume the cost of equity in utility companies is equal to a measure of the aggregate market return adjusted by an arbitrary amount, unsupported by objectively verifiable evidence.
- 2.14. However, it may not be reasonable to assume that the beta is close to one for DNOs. For highly leveraged utility companies, there are good reasons why the marginal cost of equity may be higher than the aggregate market return on equity, because of the need to reflect the additional financial risks to which their investors are exposed. Ofgem would also need to ensure that the cost of equity estimate is consistent with the level of gearing assumed in the WACC calculation.⁹
- 2.15. A problem with the CAPM “reformulation” proposed by Smithers and Co concerns the fact that, under this model, Smithers and Co estimate r_m based on long run *historic* data on equity returns. This contradicts Ofgem’s second proposal (set out in Section 1 above) that the cost of capital should be based on *forward-looking* market data. When equity market volatility is high, as has recently been the case, there are good reasons why the (expected forward-looking) aggregate return on equity is higher than the historic equity market return as explained in Section 2.9 above. The use of historic data would therefore underestimate the forward-looking aggregate cost of equity at the current time.
- 2.16. Although Smithers and Co estimate r_m based on long run historic data, they also argue that “*(i)n the absence of clear evidence of a stable mean over long samples, there may be better arguments for a forward looking approach in setting a risk free rate*”. For reasons discussed in Section 2.9 above, the use of a mixture of current and historic data is internally inconsistent and, at times of high market volatility, estimates of the risk-free rate based on current data and equity returns based on long run market data can lead to a downward bias on estimates of the cost of equity.

⁹ It is fundamental that, as gearing increases, shareholders’ returns will show greater volatility, owing to an increase in the fixed claims (interest payments) on a company’s earnings. Ofgem used an equity beta of 1.0 in the 2000 DNO price control review based on a 50:50 debt:equity structure. An assumption of higher gearing than 50:50 would then imply a beta greater than one and a required return on equity higher than the aggregate market return.

- 2.17. The conceptual basis for Smithers and Co's proposed reformulation of the CAPM also seems weak. Smithers and Co say (p.34) there is evidence that investors have systematically underestimated inflation over long periods of time, meaning that long-run *ex post* returns on risk-free assets are lower than expected. A number of academic papers contradict this assertion.^{10,11} The 'traditional' formulation of the CAPM is also widely used in academic literature and has stood the test of time (since its conception in the late 1950s). Regulators wishing to stabilise regulatory methods and to minimise regulatory risk should therefore regard with considerable caution "reformulations of the CAPM", such as that proposed by Smithers and Co.
- 2.18. Overall, we advocate that regulators should cross-check CAPM-based estimates of the cost of equity for DNOs and other utility companies against other measures of the cost of equity, but other models and their applications must satisfy the principles of being transparent and objectively verifiable. We do not believe that the "reformulation" of the CAPM by Smithers and Co obviously satisfies these criteria.

Alternatives to CAPM

- 2.19. By contrast to the UK, the CAPM is not the primary model used to estimate the cost of equity for regulated utilities in the US. Instead, Discounted Cash Flow (DCF) models are employed almost universally by US rate of return witnesses to estimate the cost of equity for US utilities. At least part of the reason for this is that the Federal Energy Regulator Commission (FERC) determination of the cost of equity for public utilities in 1985 and 1986 has been used as a generic case for setting allowed rates of return. FERC placed primary importance on the use of a DCF model to estimate the cost of equity. We recommend the use of other methods as a cross-check on the CAPM formula, to ensure that the formula continues to give representative figures. (This purpose is not the same as using alternative formulae to give conflicting estimates of the cost of capital, which creates regulatory uncertainty over outcomes.)

¹⁰ For example, Cornell (1999) says "[a]lthough the United States did experience a prolonged period of unexpected high inflation between 1973 and 1980, the rate then dropped unexpectedly over the period between 1982 and 1990...(T)his means that although bondholders have experienced both good and bad intervals because of inflation, inflation has had almost no impact over the full period on their average returns. Consequently, inflation cannot explain the large average difference between the historical returns on equity and the historical returns on long term treasury bonds." See Cornell, B (1999) "*Equity Risk Premium: The Long Run Future of the Stock Market*" John Wiley and Sons Inc.

¹¹ Draper and Paudyal recorded such a view in 1995: "*It is unlikely on the basis of current evidence available to us about markets and their use of information [ie. the efficient market hypothesis] that investors would systematically underestimate inflation over a long period of time...It is premature on the basis of current knowledge to believe that investors systematically underestimated inflation. It seems implausible that all investors around the world systematically underestimated inflation.*" See Draper, P. and Paudyal, K. (1995), 'Empirical Irregularities in the Estimation of Beta: The Impact of Alternative Estimation Assumptions and Procedures', *Journal of Business Finance and Accounting*, 22(1), pp. 157-177. See also Cooper and Currie (1999).

- 2.20. We would advocate use of DCF models as a cross-check on CAPM-based cost of equity estimates. An important advantage of the DCF over the CAPM is its ability to take into account of investors' perceptions of regulatory risk, since cost of equity estimates are based directly on market price data, into which the impact of regulatory risk is internalised.¹²
- 2.21. In estimating the cost of equity at 2005, using either the CAPM or the DCF, Ofgem faces a problem since many DNOs are now subsidiaries of larger (often foreign-owned) groups. Given the lack of share price data for individual DNOs, Ofgem has no choice when applying CAPM but to use indicative data from other, comparable companies. However, increased globalisation of capital means that market data on US electricity distribution companies and/or certain European electricity distribution companies can provide useful information on the cost of capital of UK businesses.
- 2.22. In addition to DCF, a further check on the cost of equity for electricity distribution companies comes from an examination of market data for comparable risk industries. Recent evidence on market to asset ratios and acquisition values of traded water companies shows market enterprise values (sum of equity and debt) significantly below regulatory capital values. This strongly suggests that the allowed rates of return for UK water businesses are below market costs of capital.¹³ Given that the electricity distribution industry has similar risk characteristics to the UK water industry, evidence on the market cost of capital for UK water, by comparison to the regulatory allowed rate of return, is relevant for UK electricity.¹⁴

¹² By contrast, a main weakness of the CAPM is that the beta coefficient does not fully capture the premium required by investors to compensate for asymmetric risks. It is often argued that regulated companies face greater asymmetry in their returns than is typical with unregulated businesses and therefore that the CAPM underestimates the cost of equity for regulated companies by comparison to private sector companies. If the combination of the CAPM model and asymmetric regulatory interventions produces an expected return that is less than the actual cost of capital, companies will not invest.

¹³ Since 1999, apart from Thames Water, all other acquisitions in the UK water sector have been made close to or at a discount to regulatory capital value (RCV, the water industry equivalent of the Regulatory Asset Value used in the electricity sector). With allowance for the values of non-core assets, estimates indicate that acquisition values of the core assets have been at 5-10% discounts to RCV values for the following acquired water companies: Wessex, Dwr Cymru, Mid Kent, Brockhampton, and Northumbrian.

¹⁴ Ofwat and the Competition Commission have also both noted the importance of evidence on MARs, when considered over a period of time, in understanding the industry cost of capital. For instance, in June 2001, Philip Fletcher said "...over time, if efficient companies are to be able to finance their functions...they must be able to reward adequately those who invest in them. It would be a cause of concern if widespread discounts were to prove persistent" (Speech to the IEA Conference, Birmingham). In its 2000 Report on Mid Kent Water plc, the Competition Commission wrote "... (C)aution is needed in interpreting MARs. In particular, MARs need to be considered over a period of time rather than at a single point in time" (Competition Commission (2000) "Mid Kent Water Plc", p.134).

3. USE OF FORWARD LOOKING OR HISTORIC DATA

- 3.1. Ofgem states that “*estimates of the various components of the cost of capital should be based on forward looking market based data as this provides the most robust estimates of future rates*”.¹⁵
- 3.2. Although we support the general principle that cost of capital estimates should be “*forward-looking*” since they must reflect the returns that investors require in order to commit future capital, regulators must take account of reasons why current “*spot*” asset prices may be temporarily affected by exceptional capital market conditions.
- 3.3. There are two important reasons why current spot market data may underestimate the cost of equity of UK electricity distribution companies. First, at the current time there is evidence that the Minimum Funding Requirement (MFR) continues to depress yields on index-linked gilts (ILGs), meaning that such yields are not a good estimator of the true risk-free rate. Additional factors such as the introduction of FRS17 and reduced supply of government debt have exacerbated the distortion to yields.¹⁶
- 3.4. A further reason why regulators should not estimate the cost of capital using only spot market data is that there is widespread evidence that financial markets have recently exhibited “*excess volatility*” that cannot be explained by standard economic paradigms such as the Efficient Markets Hypothesis (EMH). The implication of “*excess volatility*” and “*stock market bubbles*” is that current “*spot*” prices do not provide complete information regarding expected future values. Since “*bubbles*” are by their nature only temporary phenomena, the use of time series evidence on WACC parameters may be a better guide to true fundamentals. Recent market commentary suggests that current volatility is higher than average and excessive in nature, unjustified by the fundamentals.
- 3.5. A recent paper by Smithers and Wright¹⁷ (2002) argued that there is powerful recent evidence of misvaluation in world stocks markets and also predictability (‘mean reversion’) in stock price returns over long investment horizons.¹⁸ They conclude by

¹⁵ Ofgem (July 2003) “*Electricity Distribution Price Control Review: Initial Consultation*” para 7.8.

¹⁶ The Debt Management Office (DMO) argues that since the discount rate specified in the FRS 17 regulation is the yield of high quality (AA) corporate bonds and that the size of this AA market is “*small relative to the value of investible funds held in UK pension funds. Pension funds may consequently move more into AAA-bonds, the gilts market and other mixed portfolios of gilts and corporate bonds...*”. See DMO (2002) “*Annual Review 2001-02*”, p11.

¹⁷ Smithers A. and Wright S. (2002), *Stock Markets and Central Bankers: The Economic Consequences of Alan Greenspan*, available at www.smithers.co.uk

¹⁸ Smithers and Wright were also authors of a study on the cost of capital commissioned by the UK Joint Regulators Price Control Group, (See Smithers (2003))

saying *“There are strong reasons, both in principle and in practice, to doubt the applicability of the EMH to the valuation of the stock market as a whole.”*

- 3.6. We discuss the impact of market volatility on the risk-free rate and equity risk premium in Section 2.9. Changes in market volatility also have an impact on the beta coefficient in the CAPM. Increases in volatility may lead to a “flight to quality” into utility stocks (in the UK and abroad), and their price may fall less than others. The net effect is that the estimated beta may be lower during times of high volatility than ‘normal’ times. If the recent sample period includes an abnormal number of periods that exhibit high volatility then estimates of utilities’ betas may be lower than their true value. Similarly, if recent evidence includes less periods of high volatility than normal then the estimated betas may be too high.
- 3.7. A technical discussion of the impact of recent market volatility on beta for UK electricity companies is presents in Appendix A.
- 3.8. Our recommendation is that regulators should pay attention to the general principle that estimates of the cost of capital should be forward looking but we recommend that estimates of all WACC parameters should be evaluated over a period of time, such as over the course of a business cycle, in order to ensure that estimates of WACC parameters are internally consistent and not affected by temporary features of capital markets such as excess volatility or structural factors such as the MFR.

4. CAPITAL STRUCTURE, GEARING AND CREDIT RATINGS
 - 4.1. A key issue at the next price review concerns the appropriate gearing (and credit rating) assumption that Ofgem should make for calculation of the WACC. This assumption must be consistent with the gearing assumption Ofgem use in the financial ratio tests undertaken as a check against the bankability of the price determinations.
 - 4.2. Ofgem's July consultation paper states that "*it intends to use a level of gearing that is consistent with companies maintaining a credit rating that is comfortably within the investment grade category*". It is unclear, however, what credit rating Ofgem regards as consistent with a "comfortable" investment grade rating. It is also unclear how Ofgem's modelling is going to be undertaken in order to ensure that companies are able to maintain solid investment grade ratings. We recommend that Ofgem set out clearly its assumptions on this credit rating, for greater transparency and certainty.
 - 4.3. At the 2000 DNO Price Control review Ofgem did not take a prescriptive approach to credit ratings but argued that "*if a company wishes to organise its finances in a way to target a single A rating it is free to do so*".¹⁹ Ofgem did not appear to reconcile the assigned credit with the regulatory and business risks that are (at least partly) under the control of Ofgem, or with the projected financial ratios derived from the revenue projections. Regulated companies have a very limited ability to adjust their credit ratings by alternative financing mechanisms, without increasing the overall costs of finance.
 - 4.4. Looking forward to 2005-2010, electricity companies are likely to need to access debt capital markets to raise new debt finance over the period. There is strong evidence that, where utility companies need to raise additional new capital for capital expenditure, the efficient and prudent capital structure for them to adopt is consistent with a "single A" credit rating.
 - 4.5. A key reason for choosing a "single A" credit rating is the relatively small investor appetite for *long* term debt (>10 years) that cannot attain an A-rating or above, in either the Sterling or Euro markets. This appears to be driven by a number of factors that include: institutional restrictions on exposure to debt with a BBB-rating and below; and the relative immaturity of the UK and EU debt capital markets leading to increased liquidity premia on debt with a BBB-rating and below.
 - 4.6. Electricity companies should also maintain a "single A" rating because debt issues in the UK "index-linked" (IL) market so far been limited to companies with "single A"

ratings and above. IL debt is an attractive form of financing for UK electricity companies for a number of reasons that include:

- IL debt provides the option of matching index-linked revenues with index-linked debt service repayments, thus providing a hedge against inflation;
- IL debt has lower initial debt service repayments than nominal debt, leading to better interest coverage ratios in early years;
- Strong demand for IL debt (as a result of institutional hedging requirements for pension funds and insurance companies), coupled with limited government long-term supply, means that there is often a cost advantage for IL debt over nominal debt.

- 4.7. To ensure that the estimated WACC is internally consistent and bankability is ensured, Ofgem's assumptions regarding credit ratings and financial ratios need to be consistent. We recommend that rather than focusing solely on the central case, a lot of the analysis should aim to establish the range and likelihood of possible outcomes – by financial modelling of scenarios, sensitivity and stress testing, and techniques such as Monte Carlo analysis designed to derive key financial measure statistics (best, worst, expected outcome, probability that the outcome is outside investment grade, risk of bankruptcy).
- 4.8. An essential consistency check for all price control decisions is to ensure that the cost of debt assumed in calculation of the WACC is consistent with the projected financial ratios for a *range* of economic scenarios. It would be internally inconsistent, for example, for Ofgem to estimate a WACC including a cost of debt based on a "single A" credit rating, but to accept financial modelling that implies a lower credit rating (e.g. because it fails to meet interest cover requirements for "single A" rating).
- 4.9. Confirmation that consistency must deal with the range of outcomes can be found in rating methodologies. Rating agencies do not derive credit ratings solely by comparing indicators for a "central case" against threshold levels. They also conduct sensitivity analysis to see how each *individual* assumption (i.e. on revenues, operating costs, etc) will affect the outturn financial position. Likewise, stress-testing checks whether the financial position will be acceptable when *several* adverse factors occur at once.
- 4.10. EBITDA interest cover is a prime measure of the financial position in such analyses. Ratings depend on the whole set of findings, and so therefore do the associated debt premia and in turn the market WACC. Rating agencies continue to focus on cash

¹⁹ Ofgem (1999), "Distribution Price Control Review Draft Proposals", August 1999, para 5.8,

interest coverage measures when assessing the financial integrity of a utility companies, but are also taking a longer run view of electricity companies' financial positions and are developing more sophisticated financial measures of creditworthiness, such as interest coverage post-depreciation and/or maintenance.

- 4.11. If Ofgem decides to proceed with central case projects as the basis for setting prices, rather than a wide range of scenarios, then the thresholds should not be those applying in a situation of relative certainty. Threshold levels should be chosen in view of the likelihood that the outturn will be worse than the central case, and of the consequences (e.g. default, bankruptcy) in such an eventuality. The bigger the chance of a worse-than-central outcome, and the more severe the consequences of a worse-than-threshold result, the bigger should be the gap between the threshold levels and the levels which would be acceptable in a situation of relative certainty.

5. THE TREATMENT OF TAX

- 5.1. In its June 2003 paper, Ofgem stated that *“Where companies’ expected tax liabilities (on the basis of the gearing used to assess the cost of capital) differ significantly from allowances implicit in the approach used at previous reviews...it may be appropriate to use company-specific allowances for tax liabilities”*.²⁰ Ofgem indicates that these tax allowances could be accounted for within either post-tax or pre-tax cost WACC frameworks, but states that a post-tax approach is more likely to be appropriate if tax allowances differ between companies.
- 5.2. The proposed changes to the WACC methodology with respect to tax would bring Ofgem’s approach closely in line with that of Ofwat’s current WACC calculation methodology. We believe there are a number of strong arguments to continue setting a pre-tax cost of capital and recommend the retention of this approach.
- 5.3. A pre-tax WACC will provide incentives for companies to finance themselves efficiently. By contrast, a post-tax WACC approach distorts incentives for companies to finance themselves efficiently since any financing benefits from increased gearing and other financing mechanisms (eg. leasing) that afford corporate tax shields, are “clawed back” through a reduction in the tax allowance. The easiest and most transparent way to provide incentives for companies to finance themselves efficiently is to set an industry pre-tax WACC that is invariant to the actual capital structure decisions of utilities (but which is consistent with a reasonable capital structure and allows a reasonable prospect of cost recovery).
- 5.4. A post-tax WACC approach requires a tax allowance based on the forecast tax liabilities of each electricity company. Estimating future taxes is both complex and costly. Ofgem must make some assumption about the capital structure of each company over the regulatory period. This is likely to lead Ofgem into judging the prudence of DNOs’ historic financing decisions and increased regulatory involvement with financing decisions generally. For these reasons, a shift towards a post-tax approach will increase regulatory involvement with capital structure decisions, and may contribute towards an increase in regulatory risk.
- 5.5. Apart from the capital structure assumptions, other aspects of tax modelling (eg. asset life, depreciation, inflation) will be subjective or inaccurate, so that Ofgem’s tax modelling is unlikely to represent a company’s true liability for tax. The consequence of inaccurate tax modelling is over- or under-rewarding investors for the risks they

²⁰ Ofgem (2003), “Developing network monopoly price controls: Initial conclusions”, June 2003, para 4.11.

bear, which contributes towards increased regulatory risk. In comparison, a pre-tax WACC is simple to implement and reduces the costs of regulation.

- 5.6. A pre-tax WACC also ensures electricity utilities benefit from the impact of investment allowances in the same way as other companies. By contrast, a post-tax WACC, that sets regulated prices in accordance with actual tax liabilities, negates the impact of government tax policy (e.g. capital allowances) designed to provide companies with tax incentives to invest. If tax incentives such as capital allowances simply translate into lower revenue allowances, then utility companies do not face a level playing field with the rest of the economy, incentives to invest will be distorted, and the impact of government policy will be negated.
- 5.7. Ofgem can learn lessons from Ofwat's post-tax approach to setting regulatory returns. At the 1999 review, Ofwat's use of notional balance sheets (writing back of special dividends and other debt for equity swaps without a clear justification) for modelling tax liabilities was heavily criticised, since it meant that tax allowances diverged from actual tax liabilities for many companies, arguably contributing towards increased regulatory risk in the water sector. A pre-tax WACC does not require any regulatory involvement with actual capital structure decisions of companies.
- 5.8. Proposed Changes to the Corporation Tax System will also increase the reliability and accuracy of a pre-tax WACC approach. Most notably, changes to the tax treatment of deferred revenue and the possible phasing out of capital allowances are likely to increase electricity companies' effective tax rates over the next price control period, bringing them closer to statutory tax rates. This will increase the accuracy of a pre-tax WACC approach that uses a simple scaling formula as a proxy for actual tax liabilities over the regulatory period.
- 5.9. Finally, Ofgem would be wrong to conclude that "***a post-tax approach would improve the level of consistency across different regulators***".²¹ Although Ofwat uses a post-tax approach to setting revenues, by contrast the majority of UK regulators use a pre-tax approach for setting revenues. The Competition Commission has traditionally used a pre-tax approach in its role as economic regulator, and within the context of competition enquiries. In the Sutton East Surrey Water (SEWS) and Mid Kent Water (MKW) inquiries in 2000, the Competition Commission concluded that the pre-tax WACC is relatively invariant to changes in capital structure - hence justifying its focus on pre-tax returns rather than post-tax returns.

²¹ Ofgem (2003), "Developing network monopoly price controls: Update document 05/03" February 2003, para 6.18.

6. EMBEDDED DEBT

- 6.1. Ofgem states that *“in view of the relatively stable recent trends in real interest rates, in general Ofgem is not minded to provide additional allowance to reflect historic debt that is now out of the market, although it will consider the merits of specific points made to Ofgem on this issue by companies...”*²²
- 6.2. Under the principle of RPI-X regulation, the rate of return that regulators allow must be sufficient to continue to attract capital to finance future investments. This principle requires all regulators to allow existing providers of finance adequate returns to recover the cost of past investments. Unless Ofgem’s forward-looking estimate of the cost of debt takes account of the embedded cost of debt, it implicitly assumes the whole of the historic debt burden can be re-financed at currently low spot rates without payment of financial penalties. Clearly this is unrealistic and is equivalent to disallowing other sunk costs, with the same implications for regulatory risk and incentives.
- 6.3. This does not mean that the regulatory system must offer a *guarantee* to remunerate the costs of a utility’s actual debt portfolio. Such a guarantee would blunt the incentives for efficient financing and would probably increase cost to consumers in the long-term. We support the use of objective prudence tests as a check on a company’s financing decisions.
- 6.4. In the US the regulatory system largely avoids these problems by treating interest on existing debt as a cost, provided of course there is no suggestion of imprudence on the part of the utility. This raises the question as to why this method should not also apply in the UK. It would be possible to establish a rate of return on the current RAV sufficient to cover all costs, including interest payments, and then to apply a forward-looking cost of capital only to forecast investment.
- 6.5. Ofgem appears to justify its proposal not to allow the cost of embedded debt by asserting that recent interest rates have been “relatively stable”.²³ However, empirical evidence on the costs of debt raised by utility companies does not support this assertion. Appendix B shows that since 1999 the risk-free rate (as represented by real yields on index-linked gilts) has varied between 1.7% and 2.5% in the UK and fell by up to 1 percentage point in other G7 countries. The average debt premium for UK utilities with an interest in DNOs has also proven unstable since 1999. Current risk-free rates and debt premia are at the bottom of the recently observed ranges. The

²² Ofgem (July 2003) “*Electricity Distribution Price Control Review: Initial Consultation*”, para 7.8.

²³ Ofgem (July 2003) “*Electricity Distribution Price Control Review: Initial Consultation*”, para 7.8.

result is that any DNO acting reasonably is likely to have taken on medium-term debt during this regulatory period at rates higher than those currently on offer. These DNOs are unlikely to be able to refinance this debt without paying some kind of termination fee.

- 6.6. In order for companies to make efficient long term financing decisions, existing debt costs must be remunerated in full, unless Ofgem can demonstrate that these costs arose as the result of particular kinds of financial mismanagement or inefficiency that need to be discouraged in the future.
- 6.7. We would therefore support a “company specific” adjustment for embedded debt costs, subject to objective tests of prudence, to take account of variations between companies in the proportions of historic debt incurred at higher rates.

7. SUMMARY OF RECOMMENDATIONS

- 7.1. We support the continued use of the CAPM methodology, which has become the de facto standard for UK regulatory decisions. However, we recommend that Ofgem place greater reliance on the formula itself and also standardise the data sources. These changes will reduce the scope for “cherry picking”, which both reduces certainty over the outcome and leads to lower overall results than is consistent with objective data.
- 7.2. The WACC formula currently uses a combination of point estimates (e.g. for the risk-free rate) and long-term averages of historical time series (e.g. for the equity risk premium). Given the inverse correlation observed between these two types of variable, Ofgem runs the risk of picking inconsistent data sets. We recommend that all elements of the WACC formula should be calculated as long-term averages (over a business cycle, at least) of historical time series, in order to ensure the calculation is internally consistent.
- 7.3. Having defined the CAPM formula and data sources used to calculate the WACC, Ofgem should use other methods (such as DCF) to cross-check that the formula is working well. Ofgem should not use these other methods as alternative estimates, however, but only as grounds for adjusting the CAPM formula, if necessary.
- 7.4. Ofgem should clarify what credit rating it will be assuming in the WACC calculation, and assume conditions consistent with the same credit rating in its financial modelling. We would recommend adoption of a “single A” rating.
- 7.5. Financial modelling should ideally examine a range of scenarios, rather than just a central case, in order to check that the financial forecasts are robust. If Ofgem models only a central case, the thresholds used to appraise outcomes should be more demanding, in order to provide greater comfort that the DNOs will be viable in adverse conditions.
- 7.6. Ofgem should continue to use a pre-tax approach to estimating WACC, in order to retain profit incentives for efficient tax management and tax incentives for capital investment. The pre-tax approach has lower regulatory costs than the post-tax approach and is consistent with the practice of other regulators. (Ofwat’s use of a post-tax WACC is the main anomaly.)
- 7.7. Ofgem should make company-specific allowances for embedded debt, subject to objective tests of prudence, as the cost of debt has not been stable in recent years and is currently at a low point in the cycle. Failing to allow for the costs of embedded debt would be equivalent to denying DNOs the chance to recover other sunk costs.

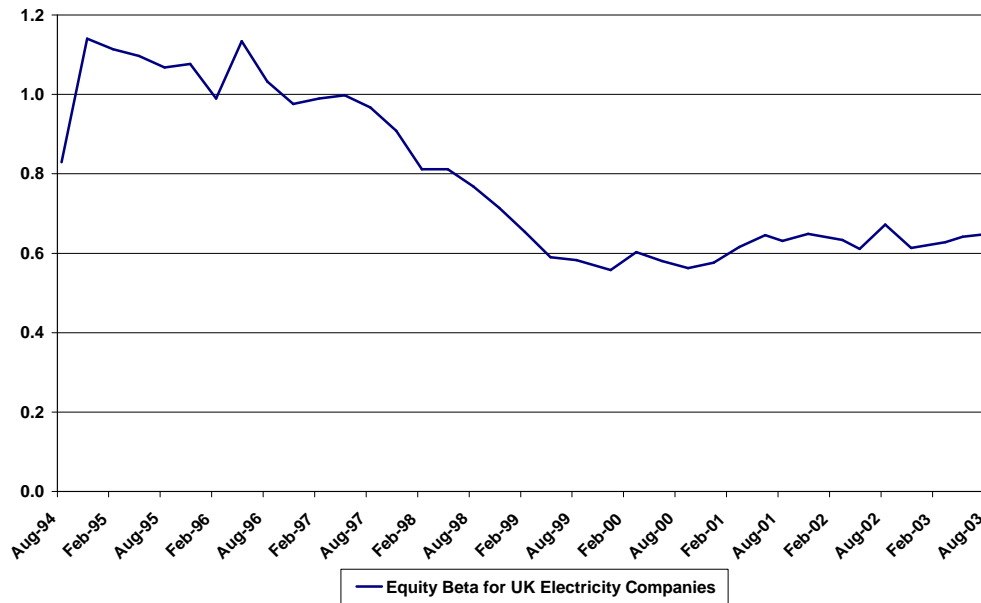
APPENDIX A. ESTIMATING BETAS FOR UK ELECTRICITY COMPANIES

- A.1. The CAPM is based on the premise that investors do not require a premium for company specific risks, since these risks are diversifiable by holding a broad portfolio of assets.²⁴ In the CAPM beta is a measure of the systematic (or, non-diversifiable) riskiness of an asset. An equity beta is defined as the covariance over time between returns on an asset and returns on the market portfolio, divided by the variance of returns on the market portfolio.²⁵
- A.2. A key issue in application of the CAPM methodology is estimation of the beta coefficient, which measures the degree of riskiness of the company (or industry) relative to the market portfolio. In the 2000 final price determination, Ofgem estimated equity betas for UK electricity companies in the range 1.0 at 50% gearing.
- A.3. In estimating a beta at 2005, Ofgem faces a problem estimating a beta for the DNOs, since many PESs are now subsidiaries of larger (often foreign-owned) groups. Given the lack of share price data for individual PESs, Ofgem has no choice when applying CAPM but to use indicative data from other, comparable companies. The choice of comparators allows Ofgem considerable leeway in deciding the relevant value of beta.
- A.4. Figure A.1 shows a rolling time series of equity beta estimates for the FTSE Electricity Index relative to the FTSE All-Share, and Figure A.2 its constituent parts (the covariance of the FTSE Electricity Index with the FTSE All-Share Index, and the variance of the FTSE All-Share Index). Each beta is calculated using weekly returns data and two year's worth of historic data. The series shows a moving window of these rolling betas over September 1994 to July 2003. Figure A.1 shows that equity betas for UK electricity companies have declined from a peak of over 1.0 pre-1997 to close to zero around 1999, rising in mid-2000 for then to fall back close to zero before rising up to above 0.6 in the latter part of 2002. The current equity beta is approximately 0.65.

²⁴ The central notion of CAPM is that in the limit as the portfolio becomes as well diversified as possible, changes in specific risk will have no effect on the portfolio. Systematic risks cannot be diversified so easily. Most companies' profits go down in a recession, for example. Investors cannot protect themselves against the risk of recession by holding shares in a range of companies. As a result, investors require a premium on the expected return in compensation for being exposed to this systematic risk.

²⁵ $b = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)}$ where r_e is the return on a specific stock; and r_m is the return on the market as a whole.

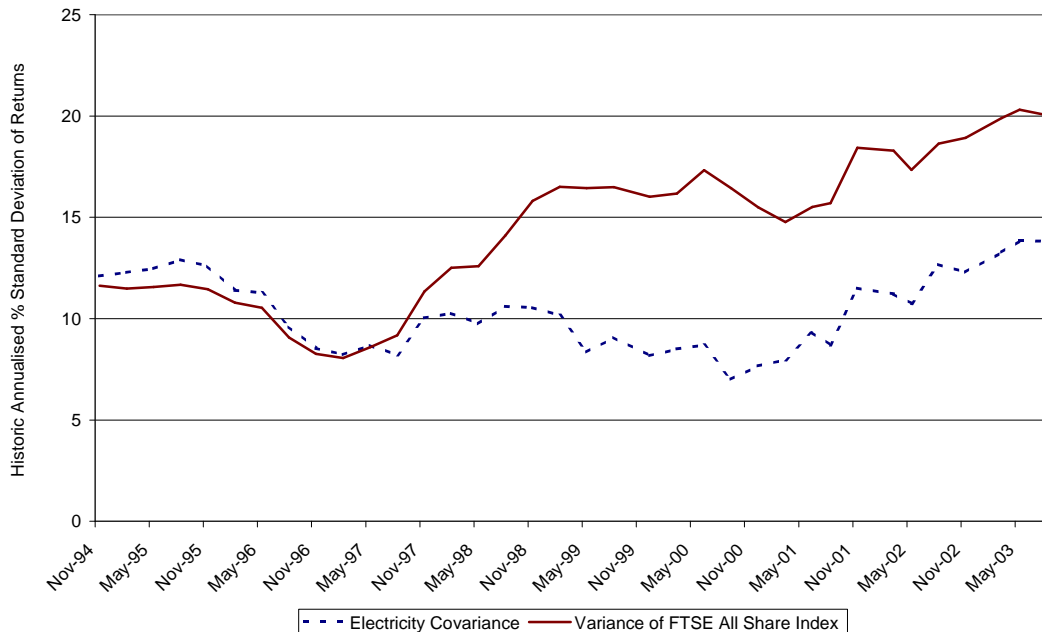
Figure A.1
2 Year Weekly Equity Betas (quarterly rolling) for UK Electricity Companies



Source: NERA analysis of Bloomberg data. UK electricity companies represented by FTSE All-Share Electricity Index: British Energy Plc, International Power Plc, Scottish and Southern Energy Plc, Scottish Power Plc and Viridian Group Plc. Raw betas are adjusted using the "Bloomberg" methodology - Adjusted equity beta = raw equity beta*0.67 + 0.33. Betas are calculated as two year rolling betas using weekly data.

A.5. Figure A.2 shows the covariance of the UK electricity companies with the FTSE All Share Index and the variance of the FTSE All Share Index.

Figure A.2
Covariance of the UK electricity companies and variance of the FTSE All Share Index,
variances and covariances calculated on a quarterly rolling 2 year basis



Source: NERA analysis of Bloomberg data.

UK electricity companies represented by FTSE All-Share Electricity Index: British Energy Plc, International Power Plc, Scottish and Southern Energy Plc, Scottish Power Plc and Viridian Group Plc.

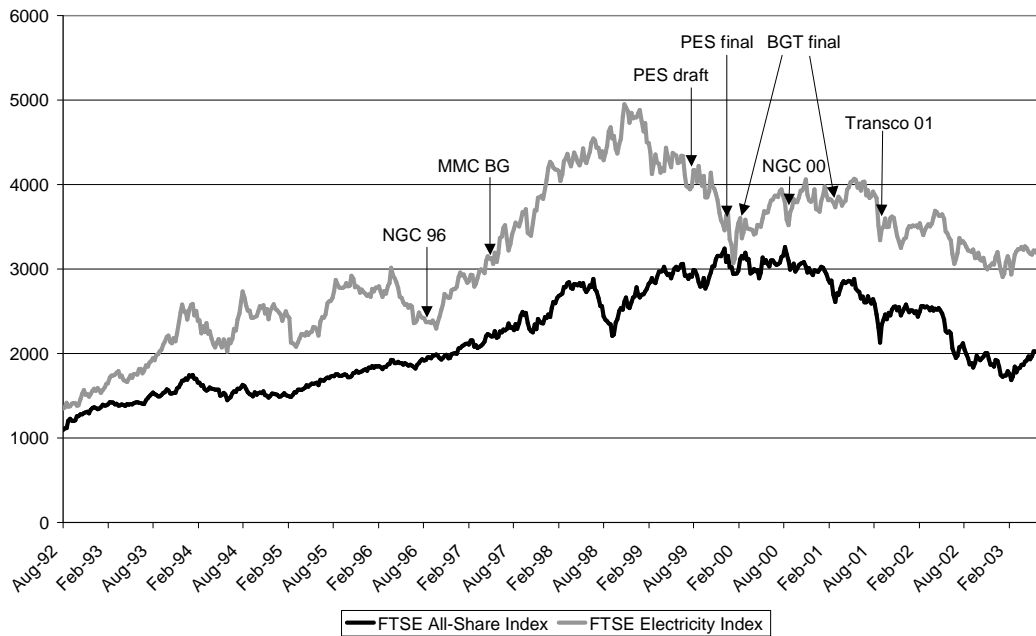
A.6. The constituent components show that there are two main factors that contribute to this change in the UK electricity sector beta estimates over this time period:

- a step increase in the variance of the FTSE All Share Index, starting in late 1997 and increasing further in 2002/03. This reflects a number of factors increasing equity market volatility, most notably, the e-commerce boom and crash in 1999 and 2000, and more recently, the global economic downturn and Iraq crisis.
- the covariance of the FTSE Electricity Index and the FTSE All Share Index dipped towards 7.5% around late 1999/early 2000, around the period of the 2000 final PES, before rising above its pre-1997 levels more recently.

A.7. Figure A.3 illustrates why the covariance of the FTSE Electricity Index and the FTSE All Share Index fell around late 1999/early 2000. The first downward movement of

the FTSE Electricity Index coincided with the release of the PES/DNO final price review document which set the climate for significant price cuts to electricity consumers and consequent lower expected returns to electricity sector investors. This occurred at a time when the FTSE All Share Index was rising, leading to a fall in the beta coefficient.

Figure A.3
Electricity Share Price Behaviour, Stock Market Volatility and Regulatory Events



Source: NERA analysis of Bloomberg data. UK electricity companies represented by FTSE All-Share Electricity Index: British Energy Plc, International Power Plc, Scottish and Southern Energy Plc, Scottish Power Plc and Viridian Group Plc.

- A.8. The exceptionally high levels of market volatility and strong negative impact of the price reviews around 2000 on electricity sector returns can both be argued to be “exceptional” events that have caused the beta coefficient to be biased downwards.
- A.9. It is not easy to correct for the impact of such factors as the Price Review and abnormally high levels of market volatility using conventional estimation techniques. Excluding the share price data over the period in which decoupling or excess market volatility occurred is equivalent to assuming that such events never happen, and including the data is equivalent to assuming that they happen every price review period. An alternative and more sophisticated technique that attempts to capture the time varying nature of beta, and avoids the need to use long run time series data, is based on the Kalman Filter. Two recent academic papers have estimated betas for

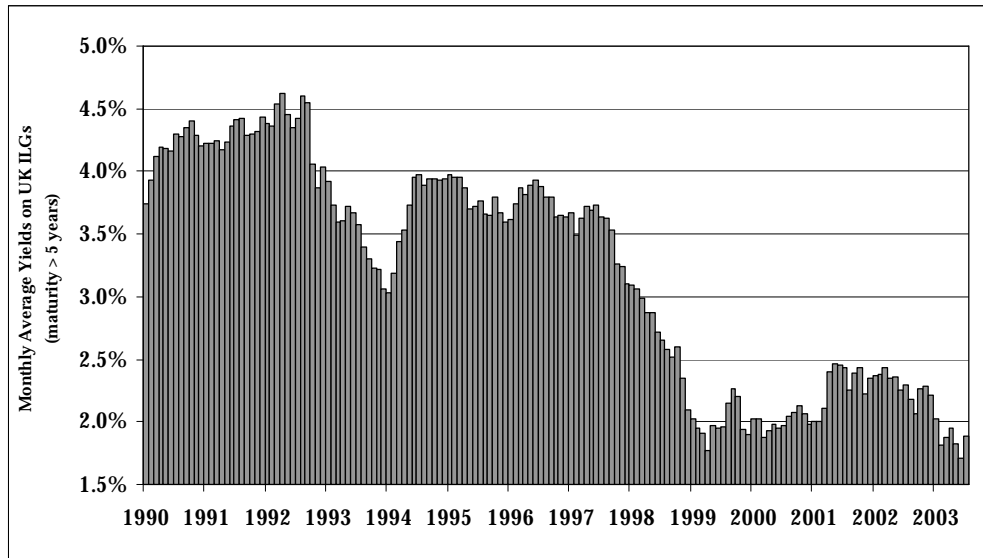
regulated UK Utility Companies using Kalman Filter techniques.²⁶ Both papers show strong evidence that betas change significantly over time and that they are influenced by external events and regulatory action.

- A.10. We suggest that Kalman Filter techniques might be preferred to the conventional long run 'moving window' regression techniques as a way to capture and demonstrate the impact of specific events such as regulatory price reviews on the beta estimate and to "correct" for the impact of such events.

²⁶ Buckland and Fraser (1999) "Political and Regulatory Risk in the UK Electricity Utilities: Beta Sensitivity in the Electricity Distribution Industry", Aberdeen Papers in Accountancy, Finance and Management: Working Paper 99-5. Francis, Grout and Zalewska (2000) "The Impact on the Stock Market of Changes in Regulation of Companies", Department of Economics and Leverhulme Centre for Market and Public Organisation, University of Bristol.

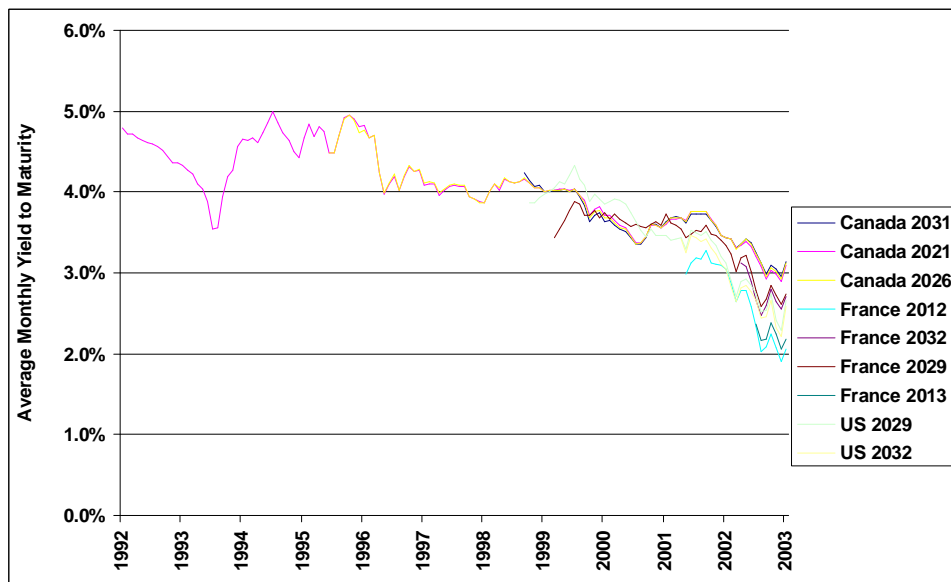
APPENDIX B. RECENT EVIDENCE ON THE COST OF DEBT

Table B.1
Average Real Yields to Maturity on UK ILGs,
January 1990-July 2003



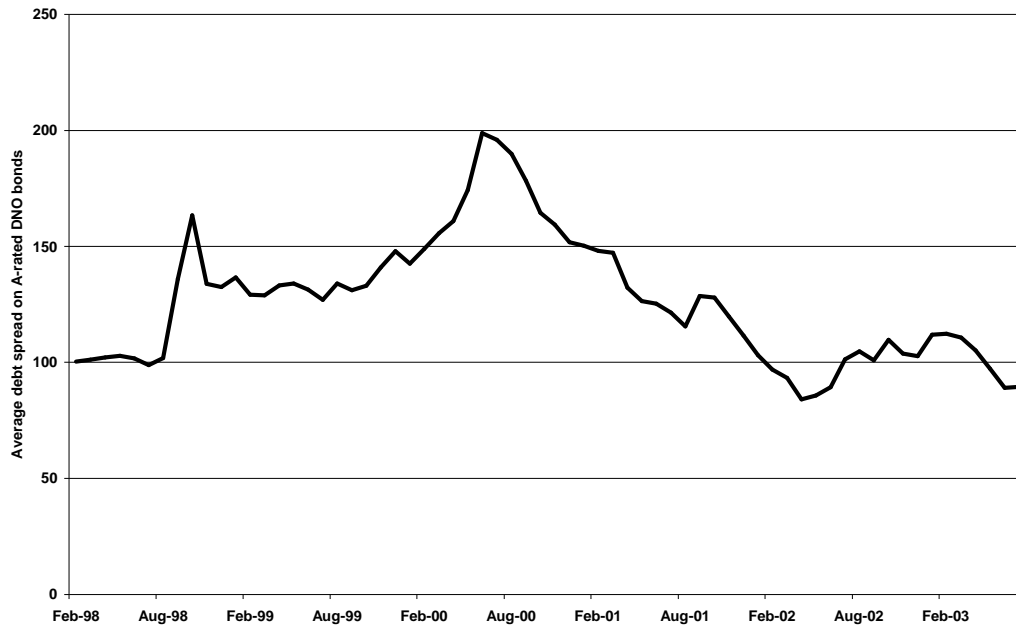
Source: NERA analysis of Bloomberg data.

Table B.2
Real Yields to Maturity on G7 Medium-term (>10 yrs in Maturity) Government IL Bonds



Source: NERA analysis of Bloomberg data.

Table B.3
Average Debt Premia in Basis Points on A-Rated DNO Debt,
February 1998- July 2003



Source: NERA analysis of Bloomberg data. **Notes:** The chart represents the average spread for current single A rated bonds, with issue data prior to or after February 1998. Bonds issued by the following companies have been included in the average: Eastern Electricity Plc, Eastern Group Plc, London Electricity Plc, London Power Networks Plc, PowerGen UK, Scottish Power UK Plc, Seeboard Power Networks Plc, United Utilities Electricity Plc.