An Estimate of NIE T&D's Costs of Capital

Prepared for NIAUR

FIRST ECONOMICS

www.first-economics.com

11 December 2011

1. Introduction

This report contains First Economics' estimates of the costs of capital for NIE's transmission and distribution businesses. It is intended to inform NIAUR's calculation of allowed returns for the RP5 price controls covering the period 2012 to 2017.

The paper is structured into six main parts:

- section 2 outlines the methodology that we have used in our work;
- section 3 assesses the risk that investors in the networks carry and puts forward estimates of the transmission and distribution betas;
- section 4 proposes figures for gearing;
- section 5 provides calculations of the cost of debt;
- section 6 contains estimates of the two generic parameters in the cost of equity calculation – the risk-free rate and the return on the market portfolio; and
- section 7 brings all of the preceding inputs together into overall estimates of the costs of capital.

2. Approach

The costs of capital that we consider in this paper are forward-looking estimates of the returns that the networks need to provide to investors in order to attract and retain capital within the businesses. In line with the terms of reference that were given to us by the Utility Regulator, and consistent with regulatory practice more generally, we have deliberately sought to estimate this cost of capital independently from NIE T&D's current ownership arrangements so that the return on offer through the price control is capable of supporting any reasonable and efficient investor set.

The cost of capital is a weighted average of two components: the cost of equity (K_e); and the cost of debt (K_d), where the weightings (gearing or g) reflect the relative importance of each type of financing in a firm's capital structure.

$$WACC = K_d.g + K_e.(1-g)$$

The cost of debt is directly measurable for many firms in the UK economy and in the analysis that follows we explain how we can use empirical evidence to benchmark the appropriate values for K_d for each business. The cost of equity, by contrast, cannot be directly observed and we have instead modelled the returns that we would expect a shareholder to demand in exchange for holding shares in the networks. The primary tool that we have used in our analysis is the CAPM, which relates the cost of equity to the risk-free rate (R_f), the expected return on the market portfolio (R_m), and a business-specific measure of investors' exposure to systematic risk (beta or β_e):

$$K_e = R_f + \beta_e \,.\, (R_m - R_f)$$

The two equations together show that our costs of capital calculations are based on estimates of five parameters: g, K_d, R_f, R_m and beta. In putting specific figures against each of these inputs we have sought to draw as far as possible on primary market data. We have also taken account of recent regulatory precedent, giving particular attention to the views that the Competition Commission expressed in its 2010 Bristol Water inquiry. Inevitably, in many areas we have had ultimately to exercise a degree of judgment in order to be able to select precise numbers from the evidence we have collected, but we have tried in the analysis that follows to give a clear explanation for these judgments and to make our thinking as transparent as possible in order to assist the parties to the NIE T&D price control review.

3. Riskiness and Beta

We start deliberately with an assessment of the networks' risk profiles and betas on the basis that the analysis that follows will also be a key input into a number of the other cost of capital assumptions.

3.1 Preliminaries

Methodology

A firm's equity beta is a measure of the riskiness of a firm – or more specifically, a measure of the systematic risk that a firm presents – relative to the market portfolio. Firms that exhibit a beta of more than 1 can be considered more risky than the average firm in the portfolio and need to pay their investors a higher-than-average return; firms with a beta of less than 1 are less risky and warrant lower returns; and firms with a beta of exactly 1 are seen by investors as being of equal risk to the market portfolio and are expected to generate a return in line with R_m.

Empirical estimates of beta are usually obtained by measuring the correlation between movements in a company's share price and movements in the value of the stock market as a whole. However, in this report we are interested in obtaining beta estimates for unlisted networks and cannot use market data directly. The next best alternative that we have is to collect beta estimates for companies that look to be in some sense similar and to make a judgment about the value of the transmission and distribution betas on the basis of this comparator evidence. This is an approach that has been deployed in an increasing number of periodic reviews, including several Competition Commission inquiries, during recent years as the number of regulated companies with a stock market listing has declined, and is regarded as a robust and reliable way of assessing beta in the absence of direct stock market data.

Asset beta

When comparing the betas of different firms, one has to be careful to take account of the different gearing levels that firms choose since, all other things being equal, a firm with higher gearing will exhibit a higher equity beta. Unless one controls for this effect, there is a danger of confusing the risk that comes from high leverage with the underlying business risk that a firm faces by virtue of the nature of the activities it is carrying out.

This is where the concept of an asset beta proves useful. An asset beta is a hypothetical measure of the beta that a firm would have if it had no debt and were financed entirely by equity. By comparing different firms' asset betas it becomes possible to isolate the underlying systematic risk that a company has and carry out an assessment of the relative riskiness of different businesses.

The asset beta is calculated using the following formula:

$$\beta_a = (1 - g) \cdot \beta_e + g \cdot \beta_d$$

where β_a is a firm's asset beta, g is gearing and β_d is the firm's debt beta.[1]

A firm's actual gearing is something that is easily calculated using reported debt figures and the firm's market capitalisation, but a firm's debt beta is not something that is directly observable. We have assumed in our work that β_d is a constant of 0.1 (the value that the CC used in its recent inquiries for companies with approximately the same nominal cost of debt as we identify in section 5).

Confidence intervals

This provides a complete description of our methodology for estimating asset betas. The only other point we must make is that beta estimates are exactly that: estimates. Every estimate that we identify comes with a standard error and the figures that follow must be regarded as mid-points within wider confidence intervals.

3.2 Comparator Analysis

Our comparator set comprises two types of data:

- calculated betas for comparator firms with a stock market listing; and
- the beta estimates that regulators have made in recent periodic reviews.

In the first of these groups we have collected beta estimates for the last remaining pure-play network companies with a UK stock market listing – National Grid, Northumbrian Water, Pennon Group, Severn Trent and United Utilities. The second group comprises the most recent assessments by the Competition Commission, the CAA, Ofcom, Ofgem, Ofwat and ORR of the cost of capital for the UK's regulated aviation, telecoms, energy, water and railway infrastructure. Ideally we would have wanted to include determinations by the Commission for Energy Regulation in our data set; unfortunately the Commission's November 2010 transmission price control and distribution price control decisions do not identify the betas underpinning the pre-tax WACCs of 5.95%.[2]

The comparator data is presented in tables 1 and 2.

[1] For those that have not come across this concept before, a debt beta is similar to the equity beta, but rather than measuring the systematic risk taken by the company's shareholders, it represents such risk presented to the company's lenders.

[2] The Commission's decision documents contain beta estimates made by the Commission's consultants Europe Economics, but since the Commission's point estimates for the overall costs of capital fall outside of the Europe Economics ranges it is not clear to us that the Commission has in any way endorsed or taken ownership of its consultants' calculations.

Table 1: Calculated asset betas

	2-year asset beta
National Grid	0.36
Northumbrian Water	0.38
Pennon Group	0.42
Severn Trent	0.39
United Utilities	0.44

Source: Thomson Datastream and First Economics' calculations.

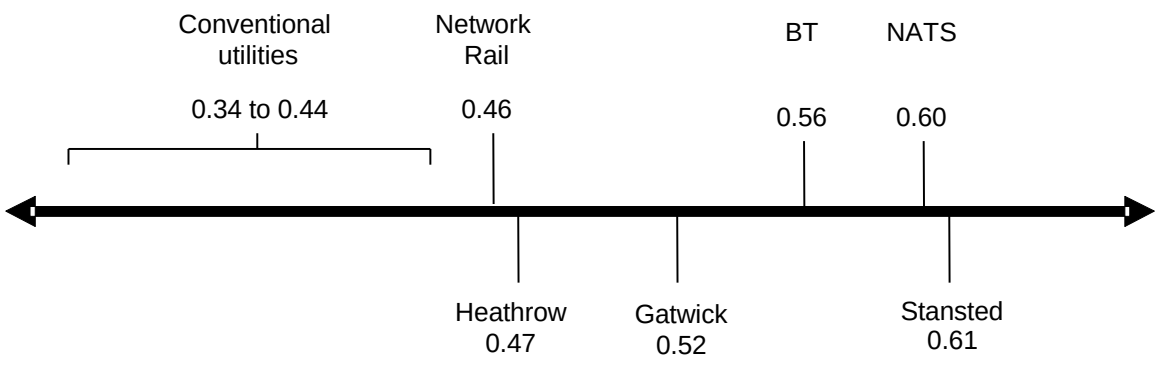
Table 2: Beta estimates used in recent periodic reviews

	Regulator's estimate of asset beta
Electricity DNOs	0.34
Electricity transmission	not stated
SONI	0.45
Water and sewerage (Ofwat)	0.40
Water and sewerage (CC)	0.36
Network Rail	0.46
BT (regulated businesses)	0.56
Gatwick	0.52
Heathrow	0.47
Stansted	0.61
NATS	0.60

References: Ofgem (2009), Electricity distribution price control review – final proposals; Ofgem (2006), Transmission price control review – final proposals; NIAUR (2011), SONI price control 2010-15 decision paper; CC (2010), Bristol Water plc; Ofwat (2009), Future water and sewerage charges 2010-15 – final determinations; ORR (2008), Periodic Review 2008 – final determinations; Ofcom (2008), A new pricing framework for Openreach – second consultation; CC (2007), BAA Ltd – a report on the economic regulation of the London airport companies (Heathrow Airport Ltd and Gatwick Airport Ltd); CC (2008), Stansted Airport Ltd - Q5 price control review; and CAA (2010), NATS (En Route) plc price control – CAA formal proposals for control period 3 (2011-14).

Figure 3 simplifies the picture that emerges from this analysis by grouping together similar types of company and highlighting the betas within each comparator type.

Figure 3: Summary of comparator analysis



The chart suggests that conventional network companies have the lowest asset betas and that NATS and telecoms and airport companies in liberalised markets have the highest betas. This is a picture that can be found in many similar reports and should not be regarded as controversial in itself. The difficult decision that we face is not to identify the betas of comparator companies but to position NIE's transmission and distribution businesses at an appropriate point in the spectrum.

3.3 Transmission and Distribution Betas

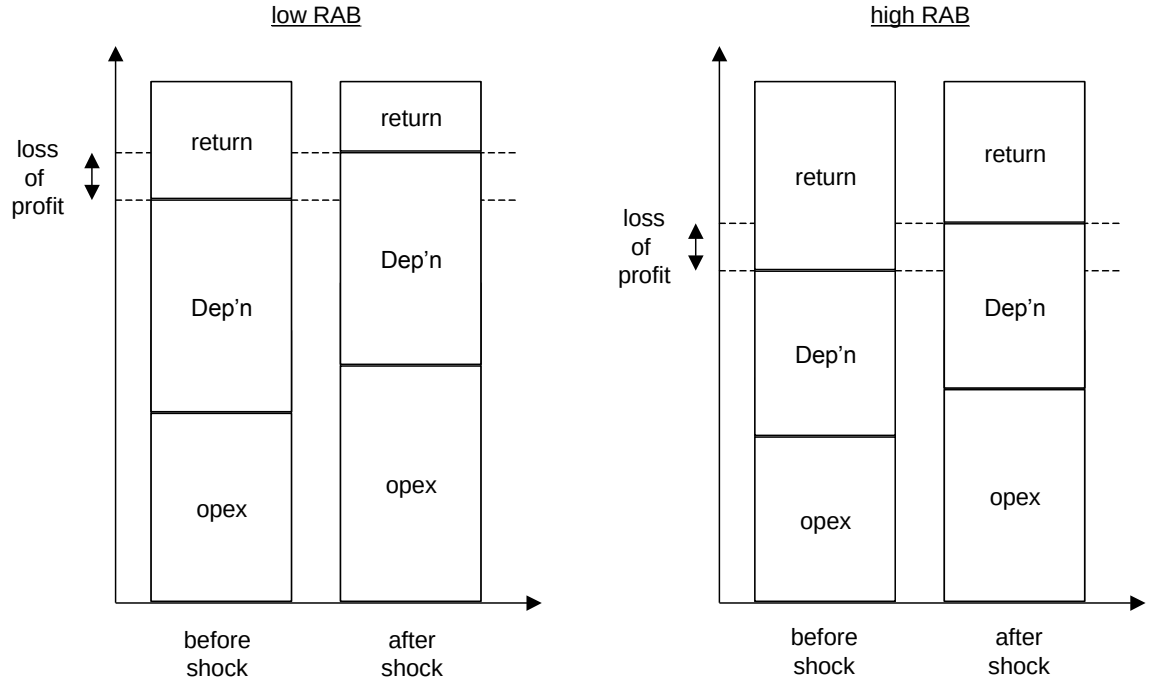
Approach to comparisons of riskiness

In working through this task it is useful to highlight four main determinants of the (systematic) risk that NIE T&D's shareholders bear through their ownership of the networks.

- Demand variability – the networks operate in markets where demand for network access is very closely correlated to the overall demand for energy in NI. This demand will in turn be sensitive to macroeconomic conditions, insofar as a downturn in the economy will cause both households and businesses to use less energy while strong growth will bring about increases in consumption.
- Cost variability – the networks rely heavily on direct and indirect staff to carry out their functions. As labour becomes more expensive costs will go up, and as labour becomes less expensive costs will go down. Similarly, the networks are exposed to changes in the costs of other inputs like materials and business rates.
- Regulation – the two previous risk factors cannot be looked at in isolation from the important role that regulation plays in determining the way in which changes in volumes or costs translate into changes in profit. Through its design of the price controls and associated incentive mechanisms the Utility Regulator has a significant degree of control over the degree to which shareholders are exposed to risk – a situation that distinguishes regulated companies from unregulated companies. In particular, revenue caps offers investors quite significant protection against changes in demand, while the Utility Regulator's design of opex and capex incentives are a major determinant of out-turn returns.
- Cost/revenue structure – a final consideration is the sensitivity of profit to out-/under-performance against the networks' price control assumptions. In particular, it is now widely acknowledged in regulation that companies which have small RABs in comparison to ongoing revenues present shareholders with much greater risk than companies which have large RABs in comparison to ongoing revenues.

The first three items on this list are fairly straightforward to understand, but the fourth merits a slightly more detailed explanation. In figure 4 we show the composition of allowed revenues for two companies with identical ongoing opex. They differ only in having different sized RABs, with the company on the left-hand side having a relatively small RAB relative to ongoing costs and the company on the right-hand side having a relatively high RAB. The diagram shows what happens to these companies' returns when they are exposed to the same cost overrun (as shown by the gap between the dotted lines). Although the absolute loss of profit is roughly the same in both companies, the percentage loss is far greater for the company on the left-hand side than it is for the company on the right-hand side.

Figure 4: Composition/allocation of revenues before and after a revenue shock



This provides important insights into the riskiness of different firms because it shows that the variability in out-turn profits is not just a function of the likelihood and scale of cost and demand shocks, but also the upfront margin that is factored into allowed revenues. Holding all other things equal, shareholders in a regulated company with a small RAB/profit relative to ongoing costs are likely to suffer proportionately more when downside shocks occur (and gain more following upside events) in comparison to shareholders in firms whose RABs/profits are large relative to ongoing costs. This volatility in profits makes companies with high 'operational gearing' more risky in the eyes of shareholders, causing them to demand higher upfront returns.

Comparison of risk profiles

It follows that in order to understand how much risk the different shareholders in our sample of firms are exposed to one has to look holistically at the potential volatility in demand and costs, take the range of outcomes that one can envisage through the sector's regulatory rules and then examine the impact on each comparator's profits. It is not possible to evaluate riskiness without taking the full chain of events into account – in particular, we would caution anyone from making judgments about a business's risk profile on the basis of perceptions of pure demand and cost variability alone.

Despite their similarities, the UK's regulated companies are not identical in any of the above respects, as table 5 demonstrates.

Table 5: Characteristics of regulated companies

	Exposure to demand risk	Exposure to cost risk	Operational gearing
GB electricity distribution	Low – companies have revenue caps	Low – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle. Price control design exposes companies to a fixed proportion of variations in most of these costs.	Low to moderate – average industry RAB-to-revenue ratio of 4.0
GB electricity transmission	Low – companies have revenue caps plus, in the case of electricity, adjustment mechanisms linked to the amount of new generation connected to the network	Low – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle. Price control design exposes companies to a fixed proportion of variations in most of these costs.	Low – average industry RAB-to-revenue ratio of 5.3
England & Wales water	Low – since 1 April 2010 companies have been regulated via a revenue cap which provides a fixed amount of income regardless of volumes	Low to moderate – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle and a more noticeable exposure to swings in energy costs. Price control design exposes companies to a fixed proportion of variations in most of these costs.	Low – average industry RAB-to-revenue ratio of 5.6
GB Rail	Low – fixed and variable elements in price control deliberately structured to exactly match ratio of fixed-to-variable costs	Moderate – a mixture of repeated opex and capital works, plus one-off large projects. Historical evidence shows there is a much higher propensity for cost overruns on capital projects compared to other industries. Price control design exposes Network Rail to a fixed proportion of variations in most of these costs.	Low – RAB-to-revenue ratio of 6.4
Telecoms	Moderate – elasticity of demand with respect to income probably around 1.0 and most of BT's charge controls are pure price caps (which means that a change in volume feeds through 1-for-1 into a change in revenues)	Moderate – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle. Price control design exposes companies to variations in all costs.	n/a

Airports	High – income elasticity probably between 1.5 and 2.0 and subject to pure price cap regulation (which means that a change in volume feeds through 1-for-1 into a change in revenues)	Low to moderate – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle and a more noticeable exposure to swings in utility costs and retail sales. Price control design exposes companies to a fixed proportion of variations in most of these costs.	Low to moderate – 3.7 at Gatwick, 4.1 at Stansted, 5.7 at Heathrow
NATS	High – income elasticity probably between 1.5 and 2.0, albeit with a price control that has a 50% fixed revenue entitlement and a 50% variable entitlement linked to distance travelled	Low – a mixture of repeated opex and capital works, plus one-off large IT investments. Historical evidence shows there is a much higher propensity for cost overruns on capital projects compared to other industries, but price control design shields companies from the risk of cost overruns.	High – RAB-to-revenue ratio of 1.9
SONI	Low – company has a revenue cap	Low – mainly repeated opex and capital works. Costs have high labour content, with some exposure to overruns on IT projects. New price control design will expose companies to variations in most of these costs.	High – RAB-to-revenue ratio of 1.8 in 2009/10

Source: First Economics' analysis.
Note: the RAB-to-revenue metric is intended to capture the observations we made earlier about the higher riskiness of firms with small RABs/profits. A high RAB-to-revenue ratio implies that profits are fairly resilient in the face of shocks and a small RAB-to-revenue ratio implies that returns can be affected quite significantly by even small variations in costs and revenues.

We make the following observations about the entries in this table:

- the conventional network businesses – i.e. the water and energy networks – all exhibit negligible revenue risk, relatively low cost risk, and have sizeable RABs. This largely explains why they sit at the left-hand side of the spectrum that we drew in figure 3; and
- all of the companies that sit to the right of the water and energy networks have fairly obvious characteristics that make them riskier in the eyes of investors. Exposure to demand and revenue risk, in particular, is an important part of what causes BT and airports to have a higher equity beta than the conventional network utilities, while SONI's and NATS' relatively small RABs explain their higher costs of capital.

The position of the NI transmission and distribution networks depends crucially on the regulatory framework that the Utility Regulator puts in place for RP5. We have been told to assume that both networks will:

- be subject to a revenue cap, which gives them a fixed income entitlement irrespective of the volumes on the system;
- be given a fixed five-year allowance for 'base' capex, with unders and overs to be passed on to customers via adjustments to RABs at the next review;
- participate in a process which sets capex allowances for renewable-related investment on a per programme basis;
- face a five-year allowance for opex; and
- share risk around projected pension contributions with customers via an end-of-period true-up mechanism.

We have been told to treat renewable-related investment as a special case to be dealt with separately by NIAUR under a bespoke regime. Focusing just on the 'base' business, we can therefore add two further entries to the list in table 5 as follows.

Table 6: Characteristics of regulated companies

	Exposure to demand risk	**Exposure to cost risk**	**Operational gearing**
NI electricity distribution	Low – companies have revenue caps	Low – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle. Price control design exposes companies to variations in most of these costs for up to five years.	Low – RAB-to-revenue ratio of 4.5
NI electricity transmission	Low – companies have revenue caps	Low – mainly repeated opex and capital works. Costs have high labour content, with some exposure to commodity prices and the construction cycle. Price control design exposes companies to variations in most of these costs for up to five years.	Low – RAB-to-revenue ratio of 4.5

We take from the above that it is very difficult to distinguish the NI networks from the conventional network businesses in Great Britain and especially from the GB electricity and distribution companies in their pre-RIIO regulatory regimes. In particular, we note that the NI and GB electricity networks' operational gearing are comparable and that NIE T&D is not unusual in facing a revenue cap. One could argue that the risk around capex is slightly lower in NI, but equally one could also argue that opex risk is slightly higher now that Ofgem is sharing within-period variations in opex 50:50 between customers and the electricity DNOs.

We therefore feel confident in saying that NI's transmission and distribution businesses exhibit the same sort of risk overall profile as a conventional GB regulated network operating under a five-year RPI – X price control. All other things being equal, they should also have the same betas. This suggests that the Utility Regulator's asset beta estimate should probably come from within the 0.34 to 0.44 range for conventional utilities identified above.

Picking an exact number requires the Utility Regulator to exercise a certain amount of judgment. We have a preference for the upper end of the range on the grounds that the implied cost of equity when using the lowest figures feels implausible. To see this, we can combine different point estimates with the risk-free rate and equity-risk premium estimates that come later and consider the implied cost of equity for a company with 0% gearing financed entirely by debt. Anything less than, say, 3.5% feels too close to the observed cost of debt and in our view should be discounted. However, any higher than the top end of the range and the Utility Regulator will start to bump up against determinations for the likes of SONI and airports which are demonstrably more risky.

Having regard to these considerations, our recommendation to the Utility Regulator is that a figure of between 0.4 and 0.425 is a reasonable input into the RP5 cost of capital calculation for both the transmission and distribution networks.

4. Optimal gearing

Assumptions about gearing affect directly the weightings of the cost of debt and cost of equity components of the weighted average cost of capital calculation. They are also important inputs to the calculation of the cost of debt and cost of equity themselves as, all other things being equal, a higher level of gearing will increase the risk to both debt and equity holders, causing them to demand a higher return in exchange for making capital available.

Assumptions about optimal gearing have to be formulated in two steps:

- first, we must consider what an appropriate credit rating is for the NI transmission and distribution businesses; and
- second, we must assess what level of gearing is likely to be compatible with that rating.

Regulatory precedent gives very firm guidance on the first of these points. In table 7 we highlight that the majority of recent regulatory decisions have implicitly or explicitly targeted an A3/A- rating. The exception is the CC's position in the 2007 Heathrow/Gatwick inquiry which targeted Baa1/BBB+. We think it is reasonable to conclude that there is a very strong consensus that the optimal gearing for a regulated network business is in the A3/A- to Baa1/BBB+ range and we do not propose to break from this consensus in our analysis. Our recommendation is that the Utility Regulator should also target an A3/A- to Baa1/BBB+ rating in the NIE T&D review.

Table 7: Target credit ratings in relevant regulatory reviews

Decision	Optimal credit rating	Year
Ofgem – Transmission (TPCR4)	A3/A-	2006
CC/CAA – Heathrow and Gatwick	Baa1/BBB+	2007
CC/CAA – Stansted Airport	A3/A-	2008
ORR – Network Rail	A3/A-	2008
Ofgem – Electricity distribution (DPCR5)	A3/A-	2009
Ofwat – Water and sewerage (PR09)	A3/A-	2009
CC – Bristol Water	A3/A-	2010
CAA – NATS	A3/A-	2010
NIAUR - SONI	A3/A-	2011

We can also use other regulators' decisions as a guide our recommendations as to the debt-to-RAB ratios that might be consistent with the desired rating. Table 8 below summarises the gearing assumptions used in the reviews in the previous table for companies with a similar risk profile to the NI networks.

Table 8: Gearing assumptions in relevant regulatory reviews

Decision	Gearing assumption	Year
Ofgem – Transmission (TPCR4)	60%	2006
Ofgem – Electricity distribution (DPCR5)	65%	2009
Ofwat – Water and sewerage (PR09)	57.5%	2009
CC – Bristol Water	60%	2010

The relevant gearing assumptions, as illustrated in this table, lie in a relatively narrow range from 57.5%-65%.

We note that NIE T&D's licence requires the company to maintain a debt-to-RAB ratio of no more than 57.5%. We also note that one of the credit rating agencies has indicated that it would consider downgrading its rating of NIE T&D's debt if gearing were to increase beyond this level. We don't take either of these things to be binding constraints: the Utility Regulator has indicated to us that it would consider modifying the licence if it could be shown that the existing condition is forcing the company to adopt a sub-optimal financial structure; and the rating agency's views were predicated at least in part on the financial linkages that currently exist between NIE T&D and its lower-rated parent company. But we do think that we should be cautious about pushing our gearing assumption too far given the costs that would fall on to customers if the company were to get into too much debt (a situation which an overly aggressive gearing assumption within the cost of capital analysis could arguably cause).

On this basis, we think it is prudent to select gearing of 60% from the above 57.5% to 65% range for both the transmission and distribution networks.

5. Cost of debt.

The interest that lenders demand from companies – unlike the returns required by shareholders – is something that is directly observable. Our task in putting a value to the cost of debt is to use available data to benchmark the interest that we would expect an efficiently financed NIE T&D business with an A3/A- to Baa1/BBB+ rating to pay on its borrowings.

The interest paid by the real-life company is a natural starting point in this analysis. Although we would not want to go as far as to match pound-for-pound the monies paid by NIE T&D in all circumstances, we think we should also feel comfortable about drawing information from the actual borrowing arrangements the company has entered into at times when the networks have encountered externally driven financing challenges. If we can say that NIE T&D responded to those challenges in the way that any normal commercial company would when faced with the same situation, it would seem logical to take the resulting interest payments as the efficient costs of financing the networks. We note that this is also consistent with the approach taken by the CC in recent inquiries.

NIE T&D's borrowings during RP5 will comprise two main tranches of debt:

- a £175m loan from the European Investment Bank which pays an interest rate of 6.875% per annum and which matures in September 2018; and
- £400m of publicly traded bonds which pay an interest rate of 6.375% per annum and which mature in 2026.

On balance, we consider it appropriate to take these interest payments directly into the cost of debt calculation.

Having looked back at market conditions in 1999 when NIE was seeking to raise new finance, we are content that the 6.875% interest rate on the EIB loan fairly reflects the cost of borrowing in the market at the time the loan was made. We also do not consider it unreasonable or inconsistent with practice across the utility sector for NIE T&D to have entered into a fixed-rate agreement.

The interest payable on the 6.375% publicly traded bonds can be compared to fixed-rate issuance by two GB DNOs just before and just after NIE T&D raised its debt.

Table 9: Recent bond market issuance from UK regulated utilities

Date of issue	Issuer	Amount	Maturity	Coupon	Rating
17/05/11	WPD (West Midlands)	£800m	2032	5.75%	Baa1/BBB
27/05/11	NIE	£400m	2026	6.375%	A-/BBB+
08/07/11	SP Distribution	£350m	2026	5.875%	A3/A-

Source: FT.com

The comparisons show that NIE T&D's borrowing costs are slightly higher than its GB peers. However, the 50-60 basis points difference is not sufficiently large for us to wish to adjust down NIE T&D's cost of debt on grounds of 'inefficiency' – the difference in coupons could be explained by a range of other factors, such as it being NIE's first foray into the public bond markets, NI specific risk factors that might be of concern to lenders and NIE T&D's relatively smaller size.

Accordingly, we are happy to conclude that NIE T&D should be allowed to raise sufficient revenue from customers to cover the interest payments it will need to make on both tranches of debt in RP5.

Combining the two interest rates into a blended average and adding 15 basis points for fees gives a weighted average cost of debt of 6.65%. We would consider this to be ample provision for any further borrowing that NIE T&D might needs to raise further debt finance during the course of RP5 and so propose to take the 6.65% figure as our cost of debt for regulatory purposes.

We need to convert this from a nominal figure to a real figure for inputting into the cost of capital computation. We advise that the Utility Regulator that the conversion for inflation should be consistent with the inflation forecasts that the regulator is using throughout the RP5 review. Pending detail on what these forecasts are we use an average annual inflation rate of 3.35% for

the reasons set out in annex 1. This means that we convert the 6.65% nominal cost of debt to a 3.2% real cost of debt.[3]

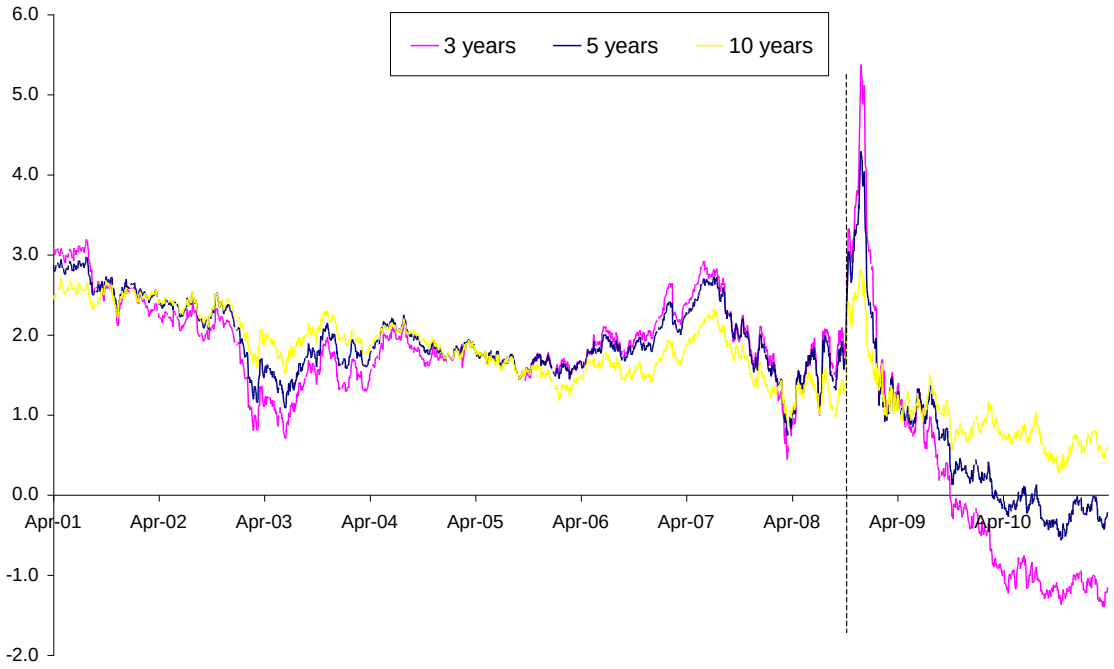
6. Generic cost of equity parameters

6.1 Risk-free rate

Having estimated the cost of debt directly, an estimate of the risk-free rate is needed solely for the purpose of estimating the cost of equity.

The approach used by regulators to assess the risk-free rate has in the past been to analyse yields on government-issued index-linked gilts.[4] Figure 10 below plots the index linked gilt yields over the last ten years, for three different maturities of bond.

Figure 10: Index-linked gilt yields



Source: Bank of England.

The main observation we would make about this chart is that gilt yields have been heavily affected by the financial crisis and subsequent recession. In late 2008/early 2009, when investors first took fright at the integrity of the financial system, yields rose considerably. Since this time the UK government, along with governments in many other western countries have sought explicitly to bring and keep yields down through adjustments to base rates and programmes of quantitative easing. The effect of these policy interventions is that the yields on short-dated gilts are now negative and the yields on even very long-dated debt sit no higher than 0.8%.

[3] The conversion formula is (1 + real cost of debt) = (1 + nominal cost of debt) / (1 + forecast inflation).
[4] The economic consultancy NERA has in recent years put forward an alternative approach which involves estimating a risk-free rate from swap rates. This methodology has been consistently rejected by regulators and hence we do not focus on it in this paper. (See Competition Commission (2008), Stansted Airport Ltd - Q5 price control review, for the most compelling critique.)

We consider the data from the last three years to be so heavily distorted by quantitative easing as to make the yield on government gilts (temporarily) an unreliable proxy for the risk-free rate. This exceptional period is so unlike anything that has come before, and indeed, so unlike anything like the period that most reasonable commentators foresee over the next five years, as to give almost no information about the returns that shareholders require in exchange for holding risk-free assets in normal market conditions. We therefore think we should disregard post-August 2008 data completely.

We feel much more comfortable looking at pre-August 2008 data as an indicator of the 'true' risk-free rate. In the ten years prior to the financial crisis, yields on our benchmark gilts from figure 11 averaged approximately 2% per annum. This is also the sort of risk-free rate that regulators have been including in recent regulatory determinations. Relevant data points are summarised in Table 11 below.

Table 11: Risk-free rate assumptions in relevant regulatory reviews

Decision	Risk-free rate assumption	Year
Ofgem - Transmission (TPCR4)	2.5%	2006
CC/CAA – Heathrow/Gatwick airports	2.5%	2007
CC/CAA – Stansted airport	2.0%	2008
Ofgem – Electricity Distribution (DPCR5)	2.0%	2009
Ofwat – Water (PR09)	2.0%	2009
CC – Bristol Water	2.0%	2010
CAA – NATS	1.75%	2010
NIAUR – SONI	2.0%	2011

It may be in the months ahead that it becomes apparent that the financial crisis has moved the risk-free to a higher or lower level. At present, we would say that it is far too early to judge whether this is the case or what the new level might be. Accordingly we think that the available evidence suggests that it is best for the time being to stick with a risk-free rate of 2.0%.

We note in conclusion that if this figure turns out to be too high or too low, the effect on the overall cost of capital calculation is very small.

6.2 Market return/ Equity risk premium

The final input into CAPM is R_m, the return on the market portfolio. Some cost of capital studies arrive at a value for R_m only indirectly by estimating an equity-risk premium and adding this figure to the risk-free rate. Like the Competition Commission, we prefer to estimate R_m directly so as to ensure that there is no inconsistency in the cost of equity calculation.[5]

Recent regulatory assumptions for the overall market return for equities are given in table 12 below.

[5] The main risk of inconsistency comes from using an R_f in the derivation of an equity-risk premium that differs from the choice of R_f that we made earlier (note that R_f appears twice in the CAPM formula and should take the same value each time). Among other things inconsistencies can arise due to the measurement of R_f over different times periods or as a result of using data from different 'risk-free' securities when deriving an equity-risk premium.

Table 12: Equity market return assumptions in relevant regulatory reviews

Decision	Equity market return assumption	Year
Ofgem - Transmission (TPCR4)	7.0%	2006
CC/CAA – Heathrow/Gatwick airports	5.0%-7.0%	2007
CC/CAA – Stansted airport	5.0%-7.0%	2008
ORR – Network Rail	6.5%-7.0%	2008
Ofgem – Electricity Distribution (DPCR5)	5.0%-7.0%	2009
Ofwat – Water (PR09)	7.4%	2009
CC – Bristol Water	7.0%	2010
CAA – NATS	7.0%	2010
NIAUR – SONI	6.75%	2011

This precedent contains a wide range for the market return from 5.0% to 7.5%. This distribution arises mainly from two methodological issues: the choice between using arithmetic and geometric approaches to averaging returns over time and the alternatives of using *ex ante* measures of the return that was expected, or *ex post* measures of the return earned.

The Competition Commission has provided considerable analysis on these issues in its recent reports. In summary they considered that:

- geometric averages were likely to understate market returns for the purposes of calculating an assumption to be used in a cost of capital going forward, and that arithmetic averages were likely to overstate returns; and
- there was relevance in assessing both *ex post* returns earned over a long historical period, and *ex ante* projections of returns expected in future. When adjusting for different risk-free rates relevant to the two timeframes, it could be observed that *ex post* measures of market return appeared to be around 2% higher than *ex ante* returns.

We take this to mean that there is no uniquely 'right' way of measuring R_m and that we should not move too far from the point estimates actually used by regulators in making their determinations.

Ofgem, in its determinations between 2006 and 2009, applied assumptions that would be at the higher end of the Competition Commission's 5.0% to 7.0% range. Similarly, the Competition Commission itself applied a spot WACC that implicitly used the very upper end of this range in both its Heathrow/Gatwick, Stansted and Bristol Water inquiries. Given these precedents, and having regard to the importance of putting forward a range for the overall WACC that is not so wide as to make it meaningless, we propose that NIAUR assume a range for R_m of 6.5 – 7.0% to be in line with the Competition Commission's thinking. When taken alongside the proposed risk-free rate of 2.0%, this gives a range for the equity risk premia of 4.5% - 5.0%.

8. Overall Cost of Capital Calculation and Conclusions

Table 13 combines our individual component estimates into a range for the overall pre-tax cost of capital. (Because all of the inputs to the transmission and distributions costs of capital are the same, we do not present separate estimates for the two networks.)

Table 13: Proposed range for the NIE T&D WACC

	Low	High
Gearing	0.60	0.60
Cost of debt (%)	3.2	3.2
Risk-free rate (%)	2.0	2.0
Market return (%)	6.5	7.0
Asset beta	0.40	0.425
Equity beta	0.85	0.91
Post-tax cost of equity (%)	5.83	6.56
Vanilla WACC (%)	4.25	4.55

The calculations give a real, vanilla cost of capital of 4.25% (using all the low estimates) to 4.55% (using all the high estimates). This compares to the RP4 allowed rate of return of around 4.69% under the price control set by NIAUR in 2006.

Generally speaking, most of our parameters are comparable to the Ofgem estimates that underpin the RP4 cost of capital. The difference in the RP4 and proposed RP5 figures is due to our lower cost of debt – i.e. 3.2% compared to ~3.6% within the RP4 cost of capital. It is important to highlight that this lower cost of debt is in turn attributable to the forecast that we have of RPI-measured inflation. While the headline numbers might therefore look low, the expected nominal return – comprised of the real cost of capital and the indexation of the RAB in line with RPI – that NIE T&D would be getting if the Utility Regulator accepts our recommendation is actually little different from the expected return in RP4.

Going forward, we would be cautious about comparisons between NIE T&D's cost of capital and Ofgem's RIIO costs of capital. Our calculations are built from the relative risk analysis in section 3 which indicates that the proposed NI and the existing GB regulatory frameworks expose investors to broadly similar levels of risk. Ofgem's RIIO model contains a fundamental redesign of regulatory arrangements and looks to us to transfer greater risk to investors, most notably as a result of Ofgem's choice of a longer 8-year control period. In such circumstances, there is no reason why the NIE T&D cost of capital should be the same as the future GB costs of capital.

In selecting a point estimate from our table 13 range, our advice to NIAUR is that it should take account of three main factors which we have seen influence regulators in other periodic reviews:

- the inevitable margins of error that exist around several of the key parameters in the calculation, most notably the estimate of beta and the calculation of R_m;
- the importance of protecting the interests of customers and setting prices no higher than they need to be; and

- the detriment that can nevertheless arise from setting the allowed rate of return too low and disincentivising NIE T&D from carrying out investments that are required by users.

In other reviews that we have worked on, regulators have tended to view the downsides of setting returns too low as more troubling than the downsides of setting returns too high and so have erred towards the upper half of estimated ranges for the WACC. How far this is appropriate in NIE T&D's periodic review depends to a considerable extent on the scale of the investment that the business is expected to carry out in the next five years and the costs that would be imposed on users if the networks are deterred from carrying out this expenditure by error in the estimation of the cost of capital. We recommend that NIAUR gives particular consideration to these issues when it considers how best to make use of the advice contained within this report.

Annex: Inflation

In our analysis of the cost of debt we needed to convert a nominal rate of interest to its real equivalent. We recommend that the Utility Regulator uses the RPI forecasts that it is using across the RP5 review in this conversion; pending these forecasts, we set out below a 'holding assumption' that permits us to put forward indicative cost of debt and cost of capital calculations.

Our calculations make use of the UK government's 2011 pre-Budget forecasts. Although these are by no means the only possible assumptions about the future direction of inflation, they have the twin qualities of being the underpinning to all of the other public-sector forecasting currently being carried out in the UK and of having been produced originally by the independent Office of Budgetary Responsibility (OBR). We think this means that they carry an authority which any alternative forecast we might otherwise choose will lack.

The November 2011 OBR forecasts are set out in table A1 below.

Table A1: RPI forecasts

	2012/13	2013/14	2014/15	2015/16	2016/17
% change	3.05%	2.95%	3.15%	3.65%	3.90%

Source: HM Treasury (2011), pre-Budget report 2011.

The table shows a relatively high rate of inflation in comparison to historical averages. This is mainly due to the anticipated unwinding of the very large reductions in mortgage interest rates which occurred in 2008 and 2009, the effect of which will be to create a temporary wedge between RPI-measured inflation and the targeted level of CPI-measured inflation.

If we average inflation over the five-year period, we find that the appropriate inflation rate for our cost of debt calculations is 3.35%.

Rate of Return For Renewables-driven Investment

Prepared for the Utility Regulator

7 December 2011

1. Introduction

The Utility Regulator has asked us to consider what rate of return NIE T&D should earn on renewables-driven investment during the RP5 control period. This short paper is structured into three parts:

- section 2 outlines the regulatory arrangements that we understand the regulator to be proposing to apply to this capex;
- section 3 explains why it is appropriate to apply a different rate of return; and
- section 4 gives an indicative estimate of what this rate of return should be.

2. Regulatory Framework

The working papers that we have been shown explain that renewables-driven investment between 2012/13 and 2016/17 will be placed in a separate pot and remunerated through a bespoke set of regulatory rules. The key features of the new arrangements are that:

- pre-construction costs are to be passed through to customers in full; and
- allowances for construction costs are to be fixed on a project-by-project basis after planning permission is received for the relevant investment.

This means that the Utility Regulator will be setting renewables-related capex allowances throughout RP5. Other capex will be dealt with under a more conventional regulatory framework, in which NIE T&D receives a fixed capex allowance for the five years of RP5 and is expected to deliver a pre-determined set of outputs in return for this funding.

3. Impact on Risk and Rate of Return

The bespoke regulatory rules for renewables-driven investment reduce the risk of NIE T&D under- or over-spending. Because allowances are to be fixed just before costs are incurred, the likelihood of over- or under-forecasting expenditure is significantly reduced in comparison to a regime in which a company has to make its best forecast of expenditure prior to the start of a five-year control period. This timing benefit will make out-turn equity returns less volatile and easier to predict.

Less risk does not automatically mean a lower cost of capital, however. Project-specific risk is normally thought of as non-systematic or something that can be avoided by holding a well-diversified portfolio of assets. Investors are not typically compensated for such risk in regulators' determinations. It is only if the bespoke rules that the Utility Regulator is proposing to apply reduce shareholders' exposure to systematic, non-diversifiable risk that the cost of capital would be lower that one could claim that it is appropriate to apply a lower rate of return.

This means it is very important to consider whether the timing benefit we have identified has any implications for systematic risk. In our view, it very clearly does. Specifically, one can attribute much of the systematic risk that shareholders are exposed to through the conventional treatment of capex to the five-year, fixed-price deal that regulators impose and the risk that wages,

materials costs and other input prices will unexpectedly move up or down within this period as a result of changes affecting the wider economy. If the Utility Regulator is proposing to move away from a five-year, fixed price deal for renewables-driven investment and towards project-by-project approval, it is as good as eliminating NIE T&D's exposure to this kind of economic risk.

Previous empirical research shows a clear relationship between the length of the regulatory lag and the cost of capital.[6] There is also evidence that regulatory regimes with higher-powered incentives produce a higher cost of capital than regimes with lower-powered incentives.[7] This literature seems to us to be directly relevant to the changes that the Utility Regulator is proposing and backs the instinctive assumption that the change in the allocation of risk ought to lower the cost of capital for renewables-driven investment and justify the award of a lower rate of return.

4. Assessment

Establishing how much of a reduction the Utility Regulator should make to its allowed return is not straight-forward. We have not been asked to undertake any detailed modelling of the distribution of out-turn costs under conventional and bespoke regulatory rules and can therefore only give some very indicative rules of thumb. These are that:

- the bespoke arrangements should affect only the Utility Regulator's assessment of beta. The risk-free rate and equity-risk premium are generic market parameters and the relevant cost of debt is the interest expense that NIE T&D will incur at corporate level;
- the asset beta cannot fall so low as to make the implied cost of equity for a company funded entirely by equity (i.e. risk-free rate, plus asset beta x equity-risk premium) less than the observed cost of debt. This would fail a test of basic plausibility; but
- neither should the asset beta be so high as to make the implied cost of equity for a company funded entirely by equity significantly more than the observed cost of debt, given the very limited exposure to systematic risk.

Having regard to these constraints, our advice to the Utility Regulator is that it would be reasonable to think that the bespoke regulatory rules might reduce NIE T&D's asset beta by around 0.1. This equates to roughly a 50 basis points reduction in the cost of capital.

Table 1: WACC estimates

	Conventional regulatory regime		**Renewables-driven capex**	
	Low	**High**	**Low**	**High**
Gearing	0.60	0.60	0.60	0.60
Cost of debt (%)	3.2	3.2	3.2	3.2
Risk-free rate (%)	2.0	2.0	2.0	2.0
Market return (%)	6.5	7.0	6.5	7.0
Asset beta	0.40	0.425	0.30	0.325
Equity beta	0.85	0.91	0.60	0.66
Post-tax cost of equity (%)	5.83	6.56	4.70	5.31
Vanilla WACC (%)	4.25	4.55	3.80	4.05

[6] See for example Gandolfi, Jenkinson, Mayer (1996), Regulation and the Cost of Capital.
[7] See for example Alexander, Mayer and Weeds (1995), Regulatory Structure and Risk and Infrastructure Firms: An International Comparison.