Benchmarking the BNE WACC for 2016

A REPORT PREPARED FOR THE ELECTRICITY ASSOCIATION OF IRELAND

June 2015

Benchmarking the BNE WACC for 2016

Contents

Benchmarking the BNE WACC for 2016

Tables & Figures

Executive Summary

Frontier Economics has been commissioned by the Electricity Association of Ireland to review the appropriate WACC for Best New Entrant (BNE) costs in 2016. In this report we set our assessment of the appropriate WACC based on:

- a 'bottom-up' assessment of the WACC, assessing each component of the WACC individually and the interactions between these; and
- 'top-down' benchmarking to cross-check ours and CEPA's estimates of the BNE WACC compared to a range of relevant generation WACC estimates.

Our estimate of the BNE WACC is 6.45% for Northern Ireland and 5.69% for the Republic of Ireland

We have completed a 'bottom up' assessment of the appropriate WACC for BNE plant, looking at each of its key components (e.g. equity market returns asset beta, cost of debt and gearing). We set out this assessment in Table 1. This gives a pre-tax real WACC of 6.45% in Northern Ireland (NI) and 5.69% for the Republic of Ireland (ROI).

By comparison, CEPA estimate pre-tax WACCs of 4.46% for NI and 4.52% for ROI. Our analysis suggests these estimates are far too low. Comparing our estimates to CEPA's proposed figures we find the following key differences.

- **In assessing equity returns we use a total market return (TMR) of 7.1% for NI and 6.8% for ROI.** This is based on the latest evidence (published in February 2015) of long-run realised equity market returns reported by Dimson, Marsh and Staunton (DMS)[1], which is a reliable source that has been widely referenced by regulators in past determinations.

  These estimates are higher than CEPA estimate of 5.5%-6.5% for NI and 5.5-7.0% for ROI, which appear to be heavily influenced by the CMA's NIE decision. The CMA had previously applied a TMR of 7% based on long-run historical averages, which is in line with the approach we are using here, but reduced its estimate for NIE in part to reflect the prevailing weak economic conditions for the NIE review period (2012-2017).

  We do not believe this approach is appropriate. Long-run historical averages provide the best indication of future expected market equity returns and therefore we base our estimates these, as has been the regulatory precedent prior to the CMA's NIE determination.

---

1 Dimson, Marsh and Staunton (2015) *Credit Suisse Global Investment Returns Sourcebook 2015*

More specifically, we have assessed the appropriate holding period to apply when estimating long-term average equity returns as these vary depending on the holding period. Using data on share turnover from the London Stock Exchange, Frontier has estimated an average holding period for equity investors of close to two years. Similarly, evidence from a survey of market participants by the CFA Institute UK suggests that the average holding period is between 1-2 years.[2] Consistent with this, GB regulators such as Ofgem and Ofwat have typically considered the TMR for a holding period of 1 year. With the conservative assumption that the average holding period is 1 year, we derive TMR estimates of 7.1% for NI and 6.8% for ROI.

- **Our estimates of the cost of debt are higher than CEPAs**. We have assessed new debt costs 'bottom up' based on the latest and most appropriate evidence on new debt costs. Because the CEPA approach is not mechanistic, the exact reasons for the different estimates are not completely clear. However, we believe the following factors are most important in explaining the difference:
  - we have benchmarked the latest debt yields for BBB firms at the bottom of our range, and below investment grade firms at the top of our range. CEPA have assumed the new entrant would always be a vertically-integrated firm with an investment grade credit rating. However, our view is that the WACC range should reflect the cost of a standalone generation investment. Given that many standalone generators do not have an investment grade credit rating the top end of our debt cost range captures this;
  - we have captured forecast increases in debt yields up to and during the 2016-2017 period that the WACC will be applied;
  - we have used a more appropriate inflation rate to convert nominal yields into real yields in NI (CPI inflation of 1.9%, rather than RPI inflation of 2.7% as CEPA have used); and
  - we have applied explicit country risk premia to the UK and EU debt benchmarks to reflect higher perceived investment risks and observed debt costs in ROI and NI.
- **We assess a gearing rate of 30% to be most appropriate for a BNE plant**. The gearing rate chosen by CEPA (60%) is much higher than: (i) observed gearing rates for generation and vertically-integrated firms; and (ii)

---

2 CFA (2012) *UK response to the Kay Review of UK Equity Markets and Long-Term Decision Making – Call for Evidence*

the range of 20-40% that the CMA recently applied to generation and vertically integrated firms in the current Energy Market Investigation.

Table 1. Assessment of the WACC for BNE 2016

	Republic of Ireland		Northern Ireland	
	Low	High	Low	High
Gearing	30.0%	30.0%	30.0%	30.0%
Cost of equity (post-tax, real)	**5.91%**	**5.91%**	**6.07%**	**6.07%**
Risk free rate	2.00%	2.00%	2.00%	2.00%
Equity risk premium	4.80%	4.80%	5.00%	5.00%
Asset beta	0.60	0.60	0.60	0.60
Equity beta	0.81	0.81	0.81	0.81
Cost of debt	**1.98%**	**4.44%**	**2.60%**	**4.96%**
WACC (vanilla, real)	4.73%	5.47%	5.03%	5.74%
WACC (pre-tax, real)	**5.32%**	**6.06%**	**6.09%**	**6.80%**
Midpoint (pre-tax, real)	**5.69%**		**6.45%**	

Note: we have used the current prevailing tax rates for the pre-tax WACC calculation: 12.5% in ROI and 20% in NI/UK.

The WACC proposed for the BNE in 2016 is substantially lower than other similar estimates of generation costs of capital

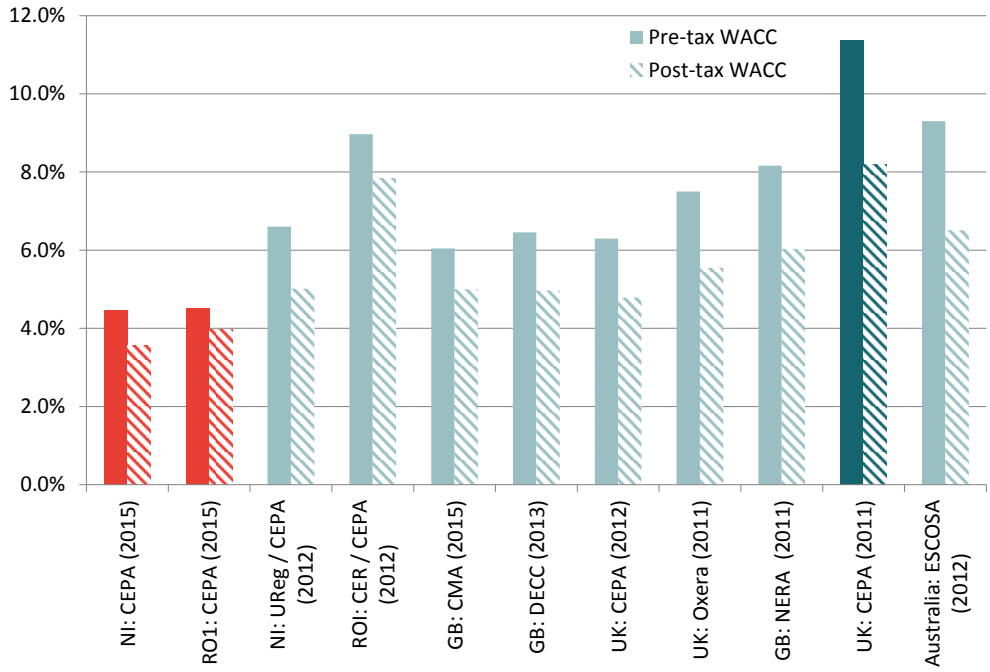
We use a 'top-down' benchmarking approach to cross-check our own analysis and CEPA's estimate of the BNE WACC, comparing these to a range of relevant generation WACC estimates in the UK, Republic of Ireland and beyond.

This comparison (see Figure 1) shows that the CEPA estimates of the BNE WACC are considerably lower than other conventional generation WACC estimates from 2011 - 2015, including the recent CMA generation WACC estimate that was made as part of the current GB Energy Market Investigation. The evidence suggests that the current CEPA estimate is around 150 to 250 basis points too low, and that an overall pre-tax WACC of at least 6% is appropriate, in line with our 'bottom-up' estimate.

In addition, financing costs in ROI and NI are currently higher than in GB and other countries, particularly in the light of major uncertainty around reform of

the SEM. In this context, setting a generation WACC which is unprecedentedly low is inconsistent with actual financing costs at present.

Figure 1. Pre-tax and post-tax WACC estimates



Source: Frontier Economics

Note: we include a comparison of post-tax WACCs to allow for a comparison which controls for different corporate tax rates across jurisdictions and across time.

1 Introduction

Frontier Economics has been commissioned by the Electricity Association of Ireland to review the appropriate WACC for BNE costs in 2016.

This report is structured as follows:

- in Section 2, we set out a 'bottom-up' assessment of the WACC, looking at each component of the WACC individually and the interactions between these. We review these components relative to those set out in CEPA's review of the BNE WACC on behalf of the regulatory authorities;
- in Section 3, we use a 'top-down' benchmarking approach to cross-check ours and CEPA's estimates of BNE WACC, by comparing them to a range of relevant generation WACC estimates from recent years; and
- in Section 4, we set out our judgement on the appropriate WACC for the BNE plant in NI and ROI, based on both our 'bottom-up' assessment and cross-checking using our 'top-down' assessment. We also compare our estimate to recent regulatory precedent.

2 'Bottom-up' assessment of the appropriate BNE WACC

In this section we set out our 'bottom-up' assessment of the WACC, looking at each component of the WACC individually and the interactions between these. We review these components relative to those set out in CEPA's review on the BNE WACC on behalf of the regulatory authorities.

We apply the standard formula for calculating the pre-tax WACC:

Pre-tax WACC = [CoE x (1 – Gearing) x (1/1 - Tax)] + [CoD x Gearing]

Where:

CoE = Cost of Equity = Risk Free Rate + (Equity Beta x Equity Risk Premium)

CoD = Cost of Debt

2.1 Assumption around the type of new entrant

CEPA's analysis assumes that the new entrant would be a vertical integrated company. This is questionable. An assessment of the WACC for BNE should consider the marginal WACC for a generation investment, not the average WACC for the company as a whole. This is one of the reasons why hurdle rates for generation investments (see Section 3) are typically significantly higher than the WACC for a whole integrated company. Because generation investments can be more risky than other investments in the company (e.g. networks), the additional generation investment will push up the WACC of the firm on average.

For these reasons, the appropriate benchmark for a BNE should allow for the possibility that the new entrant is a standalone generator. Standalone generators typically have higher costs of debt (with a lower credit rating), higher asset betas and lower gearing than integrated utilities. To illustrate this we have identified a large number of firms active in generation in ROI and UK who have credit ratings which are below the investment grade level that CEPA assume: AES Corp (BB-), Drax (BB), Infinis (BB-), Intergen (B+) and Viridian (B).

We reflect this in the following analysis of the individual components of the WACC, ensuring that the WACC for a generation firm which is standalone (and/or does not have an investment grade credit rating) is captured within the top end of our range.

2.2 Cost of equity

In this section we assess the appropriate cost of equity in NI and ROI. We first assess the total market return before assessing the components of this (risk-free rate and equity market return). We then review the appropriate asset beta.

2.2.1 Total market return

Consistent with the CMA's approach (in both the NIE determination and the current Energy Market Investigation) our preferred approach is to first estimate the total market return (TMR) - which is the sum of the risk-free rate (RFR) and the equity rate premium (ERP). We then deduct our estimate of the RFR to derive the ERP as a residual.

Some regulators estimate RFR and ERP separately, although they may then choose to undertake a sense-check on the total implied TMR. Others estimate the TMR and the RFR, and then deduce the ERP as a residual. Both methods can deliver sound results, so long as they are carried out consistently in respect of the time horizon of the estimation. However, there is strong evidence that the TMR has been less volatile than the ERP over time, and therefore a direct estimate of the TMR is likely to provide greater stability in allowed returns over time.

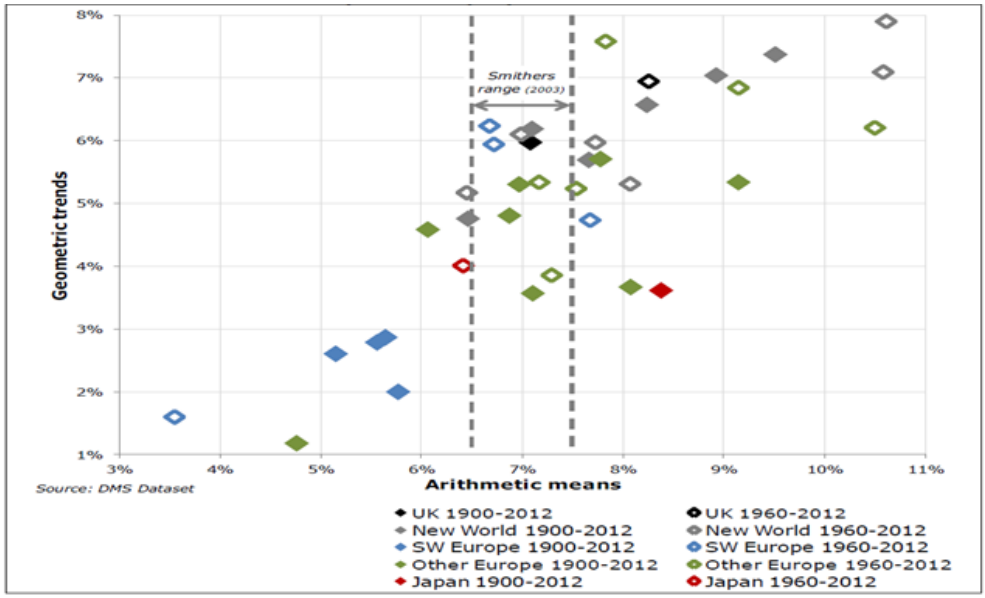
The evidence of this phenomenon and hence the motivation of using long run averages in regulation, were put succinctly and cogently in Smithers (2003)[3], a report commissioned by infrastructure regulators (and the Office of Fair Trading) in the UK. The authors of this paper noted that TMR was highly volatile from year to year, making it very difficult to draw any reliable inferences on investors' *expected* returns from short run data.

However, despite this volatility from year-to-year, the authors noted that (arithmetic) average historic returns, over very long horizons, are the best way to estimate expected returns on the market, and that these long-run averages are stable over time, in the range 6.5% to 7.5% (see Figure 2). The authors therefore recommended that regulators should not attempt to engage in analysis of short run data with the aim of estimating a contemporaneous estimate of TMR, but should instead estimate TMR in line with stable, long run averages.

---

3 Wright, Mason and Miles on behalf of Smithers & Co Ltd (February 2003), *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK.*

Figure 2. Long-term historical average equity returns



Source: Ofgem

Since the Smithers report was published its recommendations have largely been adopted by regulators. A similar focus on the long run has also been adopted by numerous other Regulatory Authorities across Europe, including the CER. Ofgem continues to make use of long run estimates in its WACC determinations, following the recent recommendations of its academic advisor, who happens to be one of the co-authors of the 2003 Smithers report[4].

We therefore consider it preferable to directly estimate TMR, from which we then deduct our RFR estimate to obtain our estimate for the ERP. Moreover, following common practice, we consider it preferable to use long run evidence on TMR, thereby avoiding the risk of undue volatility in regulatory determinations from the use of short run data, and ensuring consistency with our estimate of RFR.

We now discuss the appropriate TMR in the NI and ROI specifically.

TMR in NI (UK)

CEPA uses a range for the total market return of 5.5-6.5%. This appears to be based largely on the CMA recent determinations for NIE and their working paper on WACC for the current Energy Market Investigation.

4 Stephen Wright and Andrew Smithers (Jan 2014), *The Cost of Equity Capital for Regulated Companies: A review for Ofgem.*

'Bottom-up' assessment of the appropriate BNE WACC

We do not believe the CMA's assessment of the TMR is appropriate for the UK because it has been selective in its assessment of the historical evidence and placed too much emphasis on contemporary evidence. Long-run historical averages provide the best indication of future expected market equity returns and therefore we base our estimates on these, as has been the regulatory precedent prior to the CMA's NIE determination.

Table 2 of the CMA Working Paper for the Energy Market Investigation reports returns over a 114 year holding period. In previous assessments, the CMA has published a wider set of returns over different holding periods. For example, Table 13.7 of the NIE final determination presents the CC's estimates of the total market return for a very wide range of investor holding periods. Only 9 of the 40 observations lie below 6.5% (the top end of CEPA's range for the NI market return).

Market returns vary depending on the holding period (see Table 2). Using data on annualised share turnover for the London Stock Exchange, obtained from the World Federation of Exchanges, Frontier Economics has estimated that the average holding period for equity investors is very close to two years. Similarly, evidence from a survey of equity market participants by the CFA Institute UK suggests that the average holding period is between 1-2 years.[5] Consistent with this, GB regulators such as Ofgem and Ofwat have typically considered the TMR (and corresponding risk-free rate and ERP estimates) for a holding period of 1 year.

Based on this, **a TMR of at least 7.1% for the UK (NI) is appropriate**.

5 CFA (2012) *UK response to the Kay Review of UK Equity Markets and Long-Term Decision Making – Call for Evidence*

Table 2. UK long-run historical average equity market returns

Holding period	Total Market Return (TMR)
1 year	7.1%
2 years	7.5%
5 years	6.7%
10 years	6.4%
20 years	6.7%

Sources: DMS (2015): Credit Suisse "Global Investment Returns Sourcebook 2015", CMA (then CC) (2014) NIE Limited price determination, Table 13.7, p.13-27.

The CMA also makes use of the Fama and French approach. As the CMA acknowledged in the NIE investigation (see PD paragraph 13.135), the Fama and French approach *"remains controversial"*, and *"the statistical evidence for the UK is less extensive",* but nonetheless this analysis forms part of the CC's evidence base. In fact, there is some evidence that it is a poor predictor of realised returns. The NIE determination cites a study by Welch and Goyal (NIE PD page 13-40 footnote 34), who do not find robust evidence that forecasts of the ERP based on dividend yields were any better at predicting future returns than simply assuming a constant ERP. The study shows the forecasting performance to be particularly poor in the period since 1995. Mehra and Prescott (2003) state that *"…over the long horizon the equity premium is likely to be similar to what it has been in the past and the returns to investment in equity will continue to dominate that in T-bills for investors with a long planning horizon."* There is very little discussion of the merits and performance of the Fama and French approach in the Working Paper relative to the weight that the CMA appears to have placed on this material.

TMR in ROI

To assess the TMR in Ireland, we also consider the latest Credit Suisse Global Investment Sourcebook authored by Dimson, Marsh and Staunton. This is consistent with the approach the CER has taken in past price control decisions, where the DMS has been used as a primary source of evidence for assessing allowed equity returns.

The estimate we are interested in is the inflation adjusted annualised total equity return averaged from 1900 for Ireland. The arithmetic mean for Ireland in the 2015 edition is 6.8%, which is consistent with a one year holding period as discussed earlier. Therefore **we judge a TMR of 6.8% to be appropriate in ROI**.

'Bottom-up' assessment of the appropriate BNE WACC

This figure is also consistent with the TMR used in recent regulatory decisions in ROI as set out below Table 3.

Table 3. Recent determinations in ROI on the Total Market Return

Price control	Authority	Total Market Return
DAA charges (2015-2019)	IAA	6.50%
Mobile and fixed line (2014)	ComReg	7.10%
PR3 Mid-term review (2014-2015)	CER	7.83%

2.2.2 Risk free rate

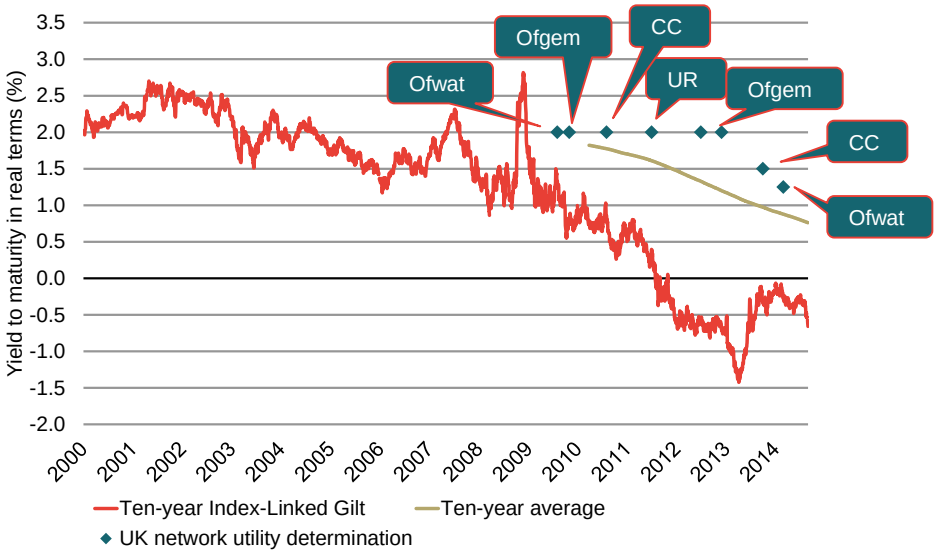
CEPA proposes are risk-free rate of 0.5-1.5% based on recent CMA determinations. We believe this is too low.

One method of assessing the RFR is to analyse the yields on government bonds (which are typically viewed as close to being risk free). In the wake of the sustained economic downturn in the past five years, the long-term government bond yields in many countries have fallen as a result of a combination of very loose central bank monetary policies and an extensive institutional 'flight-to-safety' phenomenon. The extraordinarily high demand for these relatively safe assets has raised prices and suppressed yields.

The spot nominal yield on UK government bonds with 10 year maturity is currently around 2% and the ten-year average has recently come under 3%. As can be seen in the chart, the period between 2011 and 2014 when the rate is largely under 2% constitutes around one third of the most recent ten-year averaging period, causing the current ten-year average to be at a historic low.

However, the long-term average over the last two decades and the short-term average before the crisis have more typically been around 4% (nominal). We consider 4% to be a more reliable estimate of the long run nominal RFR, as the current ten-year average is heavily distorted by the low market rates in the recent past.

Figure 3. UK regulatory precedents on risk-free rate estimation



Source: Bank of England data, regulatory publications.

In the past five years, UK energy and water regulators have all kept their estimate of the real RFR well above the prevailing ten-year average of the ten-year index-linked Gilt yield. Facing the uncertainty of how long the RFR would remain low, the regulators have good reasons to err on the safe side of allowing some degree of headroom as the risk of setting the allowance too low is disproportionate to setting it too high.

As the central banks unwind their quantitative easing programme in the future, institutional investors may follow suit in moving out of government bonds and into riskier classes of asset, and the RFR is likely then to move back towards a level more consistent with long-term historical averages and regulatory precedent.

We therefore propose a RFR of 2% for both NI and ROI.

We note that the choice of RFR does not majorly affect the WACC estimate. This is because we estimate the ERP as the residual of the TMR net of the RFR. Therefore a higher RFR means a lower ERP (and vice-versa) and, given equity betas are close to 1, the split does not affect the WACC hugely.

2.2.3 Proposed TMR, ERP and RFR

As discussed, based on evidence of long-turn realised market returns, we believe an appropriate TMR is 7% in NI and 6.8% in ROI. We then assess the ERP as the residual once we have taken off the RFR of 2%. This gives the breakdowns set out below in Table 4.

‘Bottom-up’ assessment of the appropriate BNE WACC

Table 4. Proposed RFR, ERP and TMR

	Northern Ireland	Republic of Ireland
Risk-free rate (RFR)	2.0%	2.0%
Equity risk premium (ERP)	5.1%	4.8%
Total market return (TMR)	7.1%	6.8%

2.2.4 Asset beta

CEPA have suggested an asset beta of 0.5 to 0.6 for the BNE generator (which is in line with the implied asset beta used in the 2013 BNE assessment). This range reflects observed asset betas for large European generators and vertically-integrated firms, and the CMA's range for GB generation betas in the current Energy Market Investigation.

We judge this range to be reasonable for generation in GB. However, we recommend using the top of this range (0.6) for NI and ROI given that:

- there are currently high risks facing generation in NI and ROI in the light of major market reform of the SEM and regulatory uncertainty around the impact of this on generation returns. In particular, for a new OCGT entrant the majority of revenues arise from the capacity payment and there are currently high risks around this as a result of: (i) this review of BNE costs and (ii) the reform of the SEM. This means investors in new entrants would currently require a high return on equity which should be reflected in the asset beta;
- there is evidence of higher risk in NI and ROI generally as evidenced by the existence of debt premia (see later); and
- most of the evidence on asset betas relates to large integrated firms. Therefore the lower end of CEPA range would not be consistent with a standalone generator.

2.3 Cost of debt

In this section we assess the cost of debt that should be applied for the BNE generator in NI and ROI. This is based on our assessment of the cost of issuing new debt to finance a BNE plant in 2016. We consider this in the following steps:

- we first review the current benchmark debt yields for GBP- and Euro-denominated bonds with a range of relevant credit ratings. These provide a baseline on the cost of debt estimate;
- we then adjust these to reflect forecast increases in debt yields by 2016;
- we then consider the premia on NI and ROI debt yields compared to the GBP and Euro debt benchmarks; and
- finally, we assess the transaction costs associated with issuing new debt.

This method broadly follows CEPA's "all in" debt cost methodology rather than the "risk free rate plus debt premium" method that has previously been used in the BNE WACC estimate (in 2013 and before). While we agree in principle that an "all in" approach is a reasonable approach to estimating new debt costs, it is a break with precedent and the way CEPA has applied is has not accounted for many important components. In particular: using an appropriate range of credit ratings for the debt benchmarks; applying the correct inflation rate; accounting for forecast increases in yields; and applying an explicit NI and ROI debt premium. We cover these issues in the following.

2.3.1 Choice of debt benchmark and maturity period

NI debt benchmarks

The CEPA assessment of the cost of debt for NI appears to emphasise the index of debt yields on 10 year non-financial BBB rated debt, stating these currently have nominal yields of *"c2.7-3.4%"*.

We agree that using the UK iBoxx indices provides a reliable baseline for the cost of debt given the large number of bonds in the indices. However, it is important to use the appropriate and up to date iBoxx indices, and to ensure adjustments are made to allow for: (i) increases in debt yields over the next year; (ii) transaction costs associated with new debt; and (iii) a premium on NI debt compared to GB debt.

Table 5. Current iBoxx indices of "non-financial" nominal debt yields (as of 1st June 2015)

Term/maturity	BBB rated debt
7-10 years	3.31%
10-15 years	3.74%
10+ years	4.00%
15+ years	4.14%

Source: iBoxx

Note: Indices of debt below investment grade are not available.

Table 5 shows current estimates of debt cost for BBB rated debt for different maturities. The current yield on the iBoxx index for non-Financial BBB bonds with a 7-10 year maturity is 3.31% and for a 10-15 maturity it is 3.74% nominal (on June 1st 2015). Based on this we believe, the midpoint of these estimates, 3.53%, is appropriate to use as part of the *lower end* of the cost of debt estimate because:

- the asset lifetime of the BNE plant is at least 20 years. Therefore, it is reasonable to assume that a new entrant would seek to finance using debt with a maturity of at least 10 years (particularly given the expectation that debt costs will rise in future). Or alternatively, if they were to issue shorter-term debt, the risk around refinancing (most likely at a higher cost) would need to be reflected in the allowed WACC;
- there is more volatility in bonds with shorter maturities (e.g. less than 10 years). Therefore using rate on these bonds could lead to an unreliable estimate of debt costs which does not reflect long-term financing costs; and
- a standalone generator may not be expected to have an investment grade credit rating. BBB is the index typically used for network firms which are lower risk than both vertically integrated firms and standalone generators.

For the *top end* of the range ideally an index for below investment grade debt would be used, to reflect the fact that the BNE investor could be a standalone

generator (see discussed earlier) and that these would not be expected to have an investment grade credit rating[6].

However, an iBoxx index for below investment grade debt is not available. CEPA and the CMA note that if generator was rated below investment grade credit rating, the additional debt premium would be expected to be 50-100 bps higher. We have analysed typical differences in spreads for utility debt by investment grade using data obtained from Reuters and find a larger differential[7].

As Table 6 shows, generators in the UK and ROI commonly have yields substantially higher than the BBB benchmark. We judge to a 200 bps uplift to be a reasonable uplift on the BBB benchmark to represent the top of our range. This ensures our range captures the likelihood that many new entrants (and existing generators) will not be vertically integrated or simply may not have the size needed to obtain an investment grade credit rating.

Table 6. Increase in utility debt yields for below investment grade debt with 10 year maturity (compared to BBB debt)

Credit rating	Change in yield (compared to BBB)	Example companies at this rating
BB+	+ 88 bps	
BB	+33 bps	Drax
BB-	+78 bps	Infinis, AES Corp
B+	+ 188 bps	Intergen
B	+259 bps	Viridian
B-	+333 bps	

Source: Frontier based on Reuters data.

Based on this, we assume a high end baseline debt estimate 200 bps higher than the low end (which is based on the BBB iBoxx rate). This gives a range for the current baseline yield for new debt in 2015 of 3.53% to 5.53% (nominal), capturing an investment grade entrant at the low end and a below investment grade entrant at the high end.

In determining the real cost of debt it is important to use the appropriate inflation rate. We understand that the capacity mechanism will be updated

6 As the CMA note, both Drax and AES Corp both have below investment grade credit ratings (BB).

7 http://pascal.iseg.utl.pt/~avenancio/wp-content/uploads/2013/03/Utilities.pdf

‘Bottom-up’ assessment of the appropriate BNE WACC

annually using the CPI rate. Therefore, forecasts of the CPI rate over the duration of the bond should be used to convert debt cost estimates from nominal rates to real rates.

In some of CEPA's analysis they appear to have used the Bank of England breakeven rate which provides a forecast of RPI inflation. This is relevant for network prices control WACC determinations in GB and NI because cost allowances are typically indexed to RPI inflation. However, it is not appropriate in the context of the BNE WACC because the capacity payment is indexed to CPI inflation. Because RPI is typically substantially higher than CPI, the use of RPI leads to estimates of the real cost of debt which are too low.

In the UK, the Office of Budget Responsibility provides a forecast of CPI inflation out to 2019[8]. Using these rates, and assuming inflation returns to its long-term target (2%) beyond 2019, gives an average rate of 1.9% between 2016 and 2026 (compared the 2.7% RPI rate that CEPA quote).

This gives us a current baseline yield for new debt in 2015 of 1.60% to 3.56% (real). In the next section we consider other adjustments to this rate to estimate the full cost of new debt in NI in 2016 (forecast increases in debt yields, issuance costs and an NI premium).

ROI debt benchmarks

The CEPA analysis uses a combination of current and historical debt yield data (in ROI and the Eurozone) along with regulatory precedent to obtain a baseline for the cost of new debt.

As CEPA note, finding a good benchmark is for generators in ROI is challenging due the lack of comparator bonds. CEPA cite the yields on ESB bonds but we believe these are too highly rated (BBB+) and the maturities are too short to represent a good benchmark.

We believe an iBoxx index of Eurozone bond yields serves as a useful benchmark for the *lower end* of debt cost range. The current yields for BBB rated debt in the Eurozone are:

- 2.59% for bonds with a 10+ year maturity; and
- 2.77% for bonds with a 15+ year maturity.

Based on this we judge 2.59% to be a reasonable benchmark estimate for the for bottom end of our range. As with the approach taken for the NI baseline debt range, we assume the top end of the range is 200 bps higher to reflect that a standalone generator would most likely have a below investment-grade credit rating (see Table 6). The long term forecast CPI inflation in the Eurozone is

8 OBR (2015) *Economic and fiscal outlook*

1.8%[9]. This gives us a range for the current baseline yield for new debt in 2015 of 0.78% to 2.74% (real).

This range is conservatively low given the (limited) available data on yields for firms active in generation in ROI. For example, Viridian, who own the Huntstown power plant in ROI, recently issued a euro-denominated bond, maturing in 2020 which currently has a nominal yield of 6.59% (as of 9th June 2015)[10].

In the rest of this section we consider other adjustments to this rate to estimate the full real cost of new debt in ROI in 2016 (forecast increases in debt yields, issuance costs and an ROI debt premium).

2.3.2 Forecasting 2016 and 2017 rates for NI and ROI

We understand the BNE WACC will apply in both 2016 and 2017. Therefore it is important that the assessed debt costs account for the likely increases in debt costs up to and during that period.

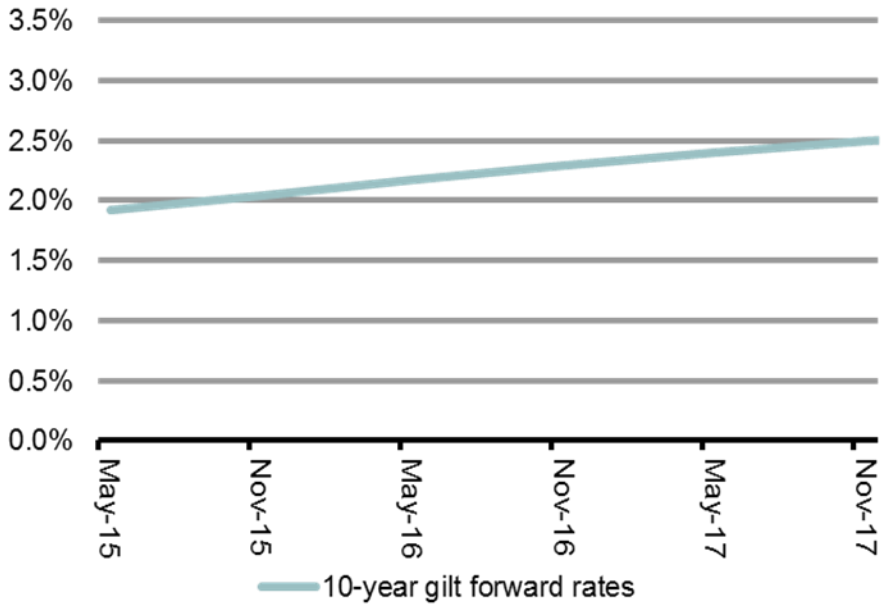
Forecast changes in NI debt yields

In NI we can capture the forecast increase in debt costs as evidenced by the forward curve on 10 year UK gilts which shows a rising trend. This curve is derived from data on spot rates for gilts of different maturities and provides an indication of likely changes to 10 year bond yields.

9 http://www.ecb.europa.eu/stats/prices/indic/forecast/html/table_hist_hicp.en.html

10 Bloomberg

Figure 4. Forward rate for UK 10 year gilts



Source: Analysis by Frontier Economics based on spot gilt rates from the Bank of England

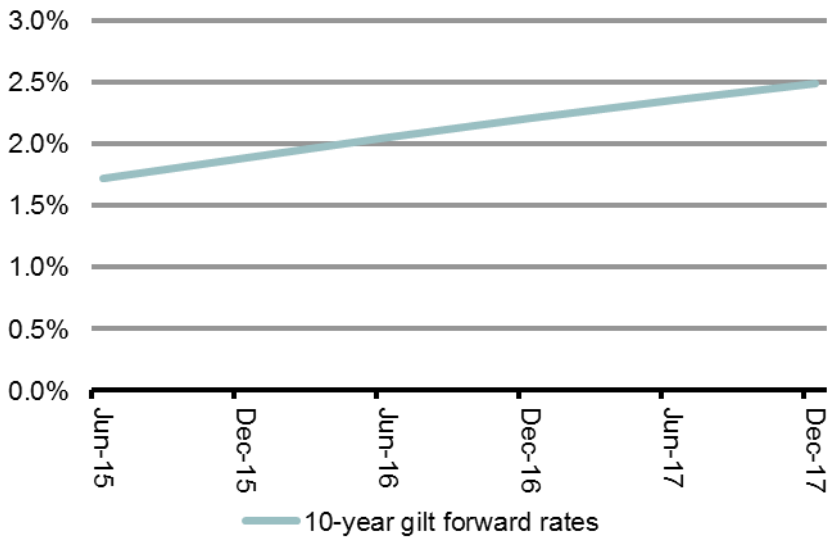
Looking at the increase in gilt rates over the next 24 months, this curve suggests that the yield on bonds will be around 60 bps higher in late 2017 than they are now. Therefore we propose that 20-40 bps is added to our baseline debt benchmarks to reflect the expected rises in debt costs before and during the 2016-2017 period.

Forecast changes in RIO debt yields

It is difficult to find equivalent data (i.e. spot rates for a range differing maturities) for ROI. However we have found similar data on European government bonds more generally. We used the same approach as described above for the UK, whereby we derive forward curves for 10-year gilts from the data on spot rates for bonds of different maturities.

The chart below shows this curve for the next few years. This shows that debt costs are expected to increase over the next 30 months.

Figure 5. Forward rate for European 10 year gilts



Source: Analysis by Frontier Economics based on spot gilt rates from the European Central Bank (all gilts)

This curve suggests that the yield on bonds will be around 80 bps higher in late 2017 than they are now. Therefore we propose that 30-50 bps is added to our baseline debt benchmarks to reflect the expected rises in debt costs before and during the 2016-2017 period.

2.3.3 NI and ROI debt premia

NI debt premium

The 2015 CEPA paper considers whether there is a case for including a NI debt premium in the BNE WACC estimates. It first notes that the CC's approach in the NIE case was to use actual debt costs, and that this approach would implicitly incorporate any NI premium in the WACC estimates.

Since it is not possible to use actual debt costs in the BNE case, CEPA then went on to look for evidence of a NI premium. It looked at the yields of NIE bonds alongside the yields of comparable GB electricity distribution bonds (Figure B.1 of the CEPA report) and concluded that *"this analysis does not indicate that an explicit premium is required for NI relative to the UK"*. However, this recent CEPA paper did not look at any evidence based on the yields of PNG bonds, despite the fact that its previous paper on BNE WACC (in 2013) did.

We have analysed the yields on PNG bonds and those of comparable GB entities. To ensure that we selected relevant GB entities to use in this comparison, we adopted the following selection criteria, which we believe best reflect the characteristics of the PNG bond:

- no index linked debt;
- bullet bonds (no repayment prior to redemption);
- Moody's BAA rating;
- utility sector;
- bonds that mature between 2015 and 2019; and
- GBP issuance.

Based on these selection criteria, we identified the following set of comparable bonds.

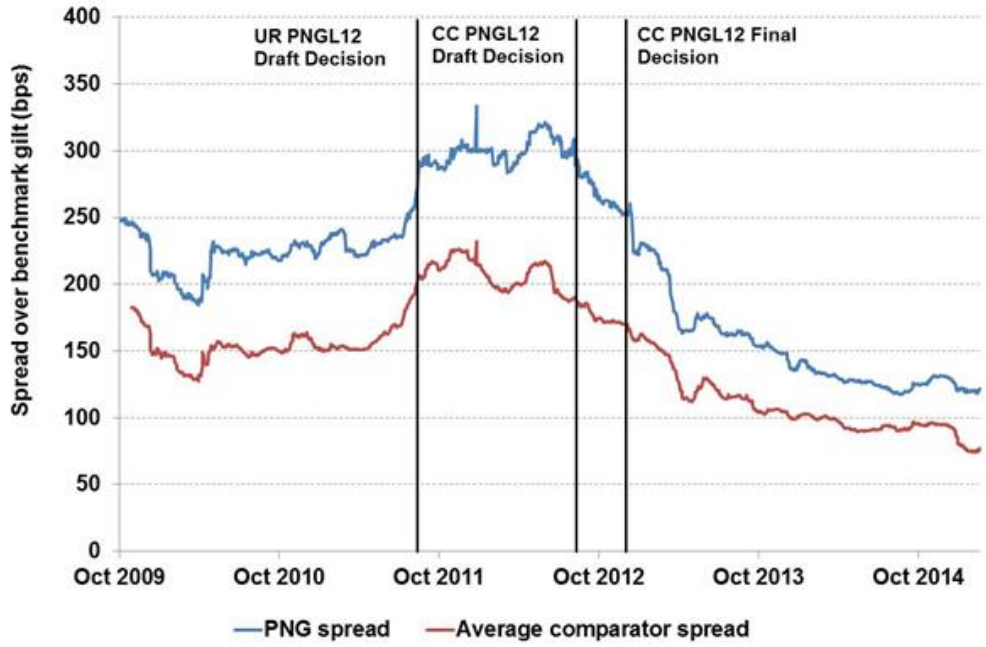
- Southern Gas Networks (SGN) Nov 2018 (Baa1)
- Electricity North West Capital Finance June 2015[11]
- Wales and West Utilities Finance Dec 2016 (Baa1)
- London Power Networks Nov 2016 (Baa1)
- Scottish Power UK Plc Feb 2017 (Baa1)
- Northern Gas Networks July 2019 (Baa1)

This is a slightly expanded set compared to the one that the CC used in its PNG case, because we do not consider that the date of issuance is a relevant selection criterion, whereas the CC did.

The chart below shows the PNG bond yields compared to those of the comparable GB companies.

11 The ENW 2015 bond does not have a Moody's rating.

Figure 6. PNG bond yields compared to comparable GB bond yields



Source: Analysis of Bloomberg data

This analysis demonstrates that there has consistently been a NI premium in the case of the PNG bonds between 2009 and 2014, with the scale of the premium varying slightly over the years. The table below shows how the estimated premium has varied in the recent past, in particular how the PNG CC case affected the estimated premium.

‘Bottom-up’ assessment of the appropriate BNE WACC

Table 7. NI Debt premium estimated using PNG and GB peers

Time period	Premium
Oct 2009 – Aug 2011 (Before UR PNG Draft decision)	69 basis points
Aug 2011 – Nov 2012 (During PNG appeal)	92 basis points
Nov 2012 – Mar 2015 (Post CC decision)	45 basis points
Oct 2009 – Mar 2015 (Entire period)	64 basis points

Source: Calculations based on Bloomberg data

This shows that the CC appeal affected the estimated NI premium, as the market responded to the increased uncertainty that the process brought, which increased the PNG bond yields. It also shows that the estimated NI premium has fallen in the recent past, as the bonds approach maturity (and hence the yields on both PNG bonds and the GB comparators approach zero).

Given these factors, we believe that the most accurate estimate of the NI premium is one which is estimated over the period October 2009 – August 2011. Our estimate of the NI premium therefore is around 69 basis points. We note that this estimate is consistent with recent precedent on the NI debt premium, including:

- the CC's decision in the PNG case of 70 basis points[12]; and
- the 50 basis point premium applied in the 2013 BNE cost assessment.

We consider that a lower bound of 60 basis points and an upper bound of 70 basis points is a reasonable range for the NI premium for BNE. The fact that there is currently a regulatory review in the SEM, which means that the future of the capacity mechanism is uncertain, also points to the fact that there is likely to be a substantial NI premium for generators at present.

12 Competition and Markets Authority (then Competition Commission) (November 2012) *Phoenix Natural Gas Limited price determination*, para. 7.73.

ROI debt premium

As CEPA note, assessing the debt premium for ROI is challenging due to the lack of data on comparable ROI bond yields. However there are clear reasons to include a substantial ROI debt premium for the BNE WACC given that:

- there is an observed debt premium in NI and generators in ROI operate in the same market facing similar risks (i.e. the SEM);
- following the debt crisis there is still a higher perception of risk around bonds in ROI compared to our general Eurozone benchmark; and
- in previous estimates of the BNE WACC, an ROI debt premium has been reflected in the cost of debt. In the 2013 BNE WACC estimate the cost of debt was derived by adding a country specific risk-free rate to a debt premium. In the case of ROI, this risk-free rate was based on Irish government bond yields and captured a country risk premium of *"200 – 400 basis points"*. We acknowledge that this risk premium has fallen but it remains substantial. The current spot premium on the Irish government 10 year bonds versus German government 10 years bonds is 93 bps, and the average premium has been 78 bps over the last year[13].

Given this we propose that a risk premium for ROI is applied which is at least as high as that in NI. We apply a range of 70 to 90 bps – with the bottom end of the range consistent with the top end of our NI range, and the top end of the range consistent with the current premium on ROI versus German government bonds.

2.3.4 Issuance and carry costs

CEPA has used issuance costs of 20 bps to reflect the transaction costs of issuing new debt. This is reasonable and reflects recent regulatory precedent in issuance costs as set out in below in Table 8.

However, the CEPA analysis does not include an allowance for carry costs which relate to costs of refinancing existing bonds (e.g. holding cash reserves while refinancing). These would need to be incurred given the assumption that the debt maturities are shorter than the lifetime of the plant (20 years).

For this reason we believe 0.2% should represent the bottom end of the range for the transaction costs associated with issuing new debt (issuance costs plus carry costs) with 0.30% as the top end.

13 Taken from Bloomberg on 16/06/2015.

Table 8. Issuance costs for new debt applied in recent regulatory determinations

	Issuance costs
CC NIE (2014)	0.20%
Ofwat PR14 (2014)	0.10%
CAA Heathrow (2014)	0.15%
CAA Gatwick (2014)	0.20%
CC Bristol (2010)	0.30%

2.3.5 Overall cost of debt and comparison with regulatory precedent

Table 9 summarises the components of our BNE debt cost estimates.

Table 9. Assessment of new debt cost for BNE 2016

	Republic of Ireland		Northern Ireland	
	Low	High	Low	High
2015 baseline debt yield (nominal)	2.59%	4.59%	3.53%	5.53%
Forecast inflation	1.80%	1.80%	1.90%	1.90%
2015 baseline debt yield (real)	0.78%	2.74%	1.60%	3.56%
Expected increase in debt yields to 2016	0.30%	0.50%	0.20%	0.40%
NI / ROI debt premium	0.70%	0.90%	0.60%	0.70%
Issuance costs	0.20%	0.30%	0.20%	0.30%
Total 2016 new debt costs (real)	**1.98%**	**4.44%**	**2.60%**	**4.96%**

To summarise:

- in **Northern Ireland** we estimate the appropriate real cost of debt to be between 2.60% and 4.96% (compared to CEPA's proposed range of 0.75% to 2.25%); and
- in the **Republic of Ireland** we estimate the appropriate real cost of debt to be between 1.98% and 4.44% (compared to CEPA's proposed range of 1.00% to 3.00%).

There is limited directly relevant regulatory precedent to provide a cross-check on these ranges. Although there have been a number of assessments of new debt costs in network, system operator and airport price controls, we believe these are less relevant because these assets are regulated with lower risks and lower debt costs. Nevertheless a cross-check against the allowed cost of debt in regulatory determinations suggests that CEPA's proposed cost of debt for the BNE is far too low (especially given that we would expect the cost of debt for regulated entities to be below that for a new entrant generator):

- in NI/UK, the NIE final determination the CMA estimated a nominal cost of new debt of 5.45%, which is equivalent to a real rate of 3.55% (using CPI inflation rate of 1.9%). This sits above the top end of our range. The Ofwat PR14 determination included an assessment for the cost of new debt of 2.10% which is consistent with the bottom of our range. Finally, the Utility Regulator recently proposed a cost of debt of 3.2% for SONI, the electricity system operator in NI. This sits in the middle of our range; and
- in ROI, the Commission for Aviation Regulation recently determined a cost of debt of 3.0% (real) for Dublin Airport for the next price control (2015-2019). Again this sits within our range.

The following estimates have been made for the cost of debt for *generators*:

- in the current Energy Market Investigation the CMA assessed the nominal cost of debt to be 5.5% to 7.0% for generation firms and 5.0% to 6.0% for vertically integrated firms. In real terms (using an average 2007 to 2014 inflation rate of 2.75%) the real debt costs range from 2.68% to 4.14% and 2.19% to 3.16%. These sit within our proposed ranges for debt costs (although we note the CMA's assessment of debt costs was backward looking and the BNE assessment is forward looking); and
- in the 2013 BNE cost assessment, a cost of debt of 3.25-4.25% was estimated for NI and 3.50-8.50% was estimated for ROI. Our proposed range still represents a large reduction from this level, reflecting reductions in debt costs in recent years.

'Bottom-up' assessment of the appropriate BNE WACC

In summary our analysis shows that the cost of debt for the BNE should be at least 150 bps higher on average than CEPA have proposed.

2.4 Gearing

CEPA uses a gearing rate of 60%. This is too high - it is inconsistent with observed gearing levels and with the assumption of investment grade debt costs.

The CEPA analysis appears to put high emphasis on the gearing rates from *regulated network firms* (both the actual gearing rates and those applied in the regulatory determination of the WACC). However, these are not relevant for the assessment of the WACC for a new entrant *generation firm*. Firms with a large proportion of their business represented by generation typically have much lower gearing rate, reflecting the higher risks.

This is recognised in the CMA's recent assessment of the generation and vertically-integrated WACC in the current Energy Market Investigation, where a gearing rate of 20% to 40% is applied. Although we do not agree with other parameters the CMA applies, this range appears reasonable given the observed gearing rates (see Table 10 below).

This particularly true given that many of the sample firms have large regulated businesses, which reduces risk and typically allows for higher gearing than would be possible for a standalone generation firm. Moreover, high gearing rates would be highly unlikely for a new entrant in ROI or NI, given the relatively high regulatory risk in the SEM resulting from current reforms to the market.

Finally, we also note that the gearing rate of 60% and the proposed capacity payment imply a very high ratio of debt to EBITDA, of the order of 8. This is more than double the level that would be consistent with the investment grade credit rating that CEPA have assumed.

Based on this evidence, **we suggest a gearing rate of 30% in both NI and ROI**. Reducing the gearing rate from 60% to 30%, holding all of CEPA's other parameters constant, increases the WACC by around 10 bps.

Table 10. Observed gearing rates for large generators and vertically integrated firms (average 2006-2013)

Generation firms	Gearing	VI firms	Gearing
GDF Suez	39.1%	Centrica	15.4%
Drax plc	4.8%	SSE	27.0%*
AES Corp	66.8%*	EDF	37.2%
AEP Corp	47.8%*	E.ON	36.0%
		Iberdrola	43.7%*
		RWE npower	29.6%
		Enel	62.1%*
		Gas Natural Fenosa	44.6%*
		EnBW	30.2%*
		Fortum Oyj	29.0%
		Contact Energy	20.1%
		TrustPower	21.8%
		NRG Energy Inc	59.1%
		Origin Energy	14.8%
		AGL Co	27.1%

Source: CMA analysis based on Bloomberg data

*denotes firms where a large proportion of their business is regulated

The full breakdown of our 'bottom-up' WACC estimate is set out in Section 4.

'Bottom-up' assessment of the appropriate BNE WACC

3 'Top-down' benchmarking of the BNE WACC

In this section we use a 'top-down' benchmarking approach to cross-check our estimate of the BNE WACC and CEPA estimate, by comparing them to a range of relevant generation WACC estimates.

This comparison shows that the CEPA estimate of the BNE WACC is considerably lower than other conventional generation WACC estimates from 2011 - 2015, including the recent CMA estimation that was made as part of the GB retail market investigation. This difference cannot be explained by any of the factors that have a significant impact on the WACC.

3.1 Selection of comparator estimates

There are a range of factors that can affect the level of generation WACC estimates. In making this 'top-down' comparison, we were cognisant of those factors, and only included the more relevant estimates.

Firstly, we recognise that comparisons across WACC estimates over time need to be interpreted with care. Estimates will differ in terms of the publication date, and also in terms of the forecast period. That being said, we believe that comparisons over time can still be informative, as long as any timing issues are recognised in any conclusions that are drawn. Bearing this in mind, we have only included estimates from 2011 – 2015.

Secondly, the type of technology is a significant differentiator in WACC estimates. For example, all other things being equal, a renewable technology would generally have a higher WACC than a more conventional technology, as there is more technology and construction risk involved. We note that the CEPA estimate is based on a conventional peaking plant. We have therefore primarily used estimates that are based on conventional thermal plants. We have included a renewable example as a point of reference.

We also recognise that there are likely to be other more marginal factors in determining WACC estimates. The CEPA estimate is based on an unregulated market, and so we have only looked at WACC estimates for unregulated cases. This is because a regulated generation firm is likely to be exposed to relatively lower risk than one which has full merchant exposure, and as such should command a relatively lower WACC. The CEPA estimate is also based on the assumption that the firm would engage in capacity markets, and where possible we have used cases with capacity markets to ensure comparability.

We have also found estimates from a range of different countries. We recognise that the countries will differ somewhat in terms of corporation tax rates. As a result of this, we have presented post-tax WACC estimates as these offer a more comparable measure across countries.

We also recognise that the methodology used could affect the scale of the estimate. In the majority of cases, the CAPM model is used to estimate the cost of equity, and data on bond yields is used to estimate the cost of debt. The majority of cases in our comparison match this approach, and are therefore in-line with CEPA's approach, however a small number rely on hurdle rates.[14]

3.2 Top-down comparison

The table below shows CEPA's estimate of the BNE WACC and the relevant comparator estimates that we have found. We have also provided details on the factors that we have identified as influencing WACC estimates, and a short description of the approach used to estimate the WACC in each case

14 A hurdle rate is the minimum required rate of return for an investor to go ahead with a project.

Table 11. Top-down benchmarking of BNE WACC

Publication date	Country	Technology	Regulated	Capacity mech.	Basis of methodology	Real pre-tax WACC	Real post-tax WACC	Real Vanilla WACC[15]
2015 (CEPA's review)	***NI***	***Peaking plant (vertically integrated)***	***Unregulated***	***Yes***	***CAPM for the cost of equity and an 'all-in' estimate of the cost of debt***	***3.70 – 5.23%***	***2.96 – 4.18%***	***3.05 – 4.45%***
	ROI					***3.66 – 5.38%***	***3.21 – 4.71%***	***3.28 – 4.93%***
2015 (CMA)	GB	All technologies (generation firm)	Unregulated	No	CAPM for the cost of equity and cost of debt estimated with reference to the actual interest rates paid by the energy firms and corporate bond yields	5.17 – 6.92%	3.77 – 6.23%	
2013 (DECC)	GB	Coal, Gas CCGT, Gas OCGT	Unregulated	No	Hurdle rates specified by DECC, based on various studies	6.46%	4.97%	
2011 (NERA for Scottish Power)	GB	CCGT and OCGT	Unregulated	Yes	Rely on market data in the form of the hurdle rates actually used by investors (e.g., City analysts) to value and appraise specific types of investment, which must incorporate any "option premium".	8.16%	6.04%	

15 Not all reviews provide the necessary breakdown of WACC components to estimate a vanilla WACC.

2012 (CEPA for CER and NIAUR)	UK	OCGT	Unregulated	Yes	CAPM as the primary tool for estimating the cost of equity, with a cross-check to recent regulatory precedent. For the UK debt premium looked at spreads over benchmark gilts, as well as costs for recent issues by investment grade utilities in the UK	6.30%	4.79%	5.33%
2012 (CER and UReg, based on CEPA)	NI	OCGT	Unregulated	Yes	Decision document based on CEPA work and NIE Ureg draft decision, and BNE consultation	6.60%	5.02%	
	ROI					8.97%	7.85%	
2012 (Essential Services Commission of South Australia)	Australia	Integrated Utility	Unregulated	No	Based on ESCOSA's draft report on WACC parameters and key inputs on how this could be adjusted for an integrated utility	9.30%	6.51%	
2011 (CEPA)	UK	Offshore wind	Semi-regulated	No	Hurdle rates, based on project returns and consultations with market participants	10.02 – 12.72%	7.21 – 9.16 %	8.48 – 10.43%
2011 (Oxera)	UK	CCGT	Unregulated	No	The discount rate estimates presented in this report rely on evidence reported in the available literature, supplemented by estimates reported by industry participants in a survey conducted by Oxera.	7.50%	5.55%	

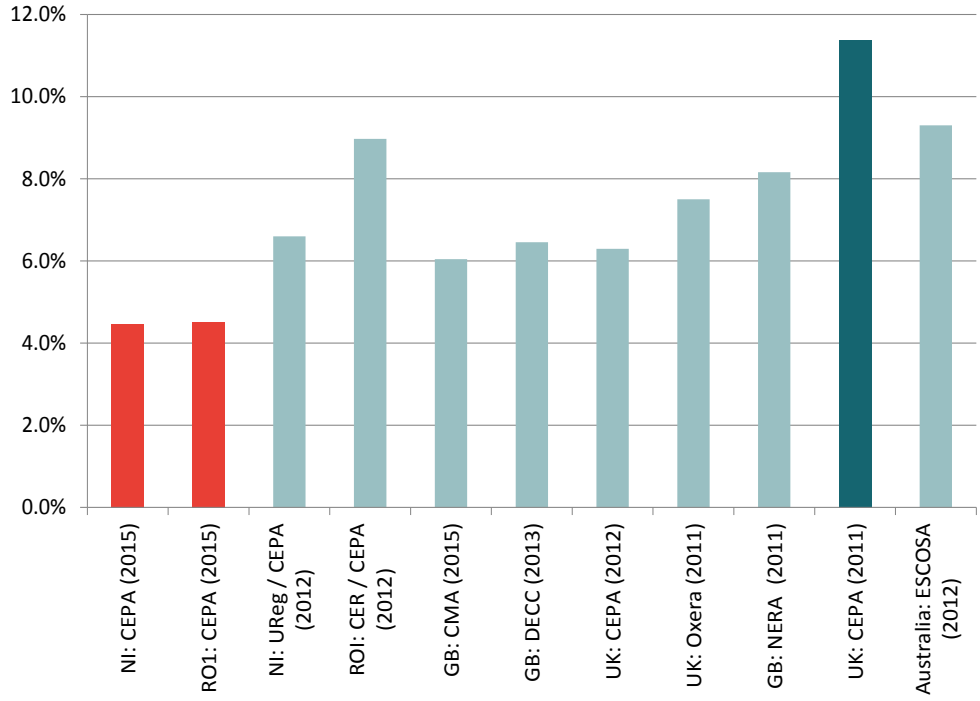
Source: Frontier Economics review of a range of external sources (In some cases it was necessary to use the relevant corporation tax rate to convert pre/post-tax WACC estimates into post/pre-tax WACC estimates. Where data allowed we used the corporation tax rates from the relevant publication year. In some cases it was necessary to use published inflation rates to convert the published nominal rates into real rates; for this we used published CPI figures)

‘Top-down’ benchmarking of the BNE WACC

Overall, this comparison shows that the CEPA estimate of the BNE WACC is considerably lower than other conventional generation WACC estimates from 2011 - 2015, including the recent CMA estimation that was made as part of the GB retail market investigation.

To show the scale of this difference, we present the real pre-tax WACC estimates in the following chart, as this is the measure that CEPA published in its BNE report.

Figure 7. Real pre-tax WACC estimates

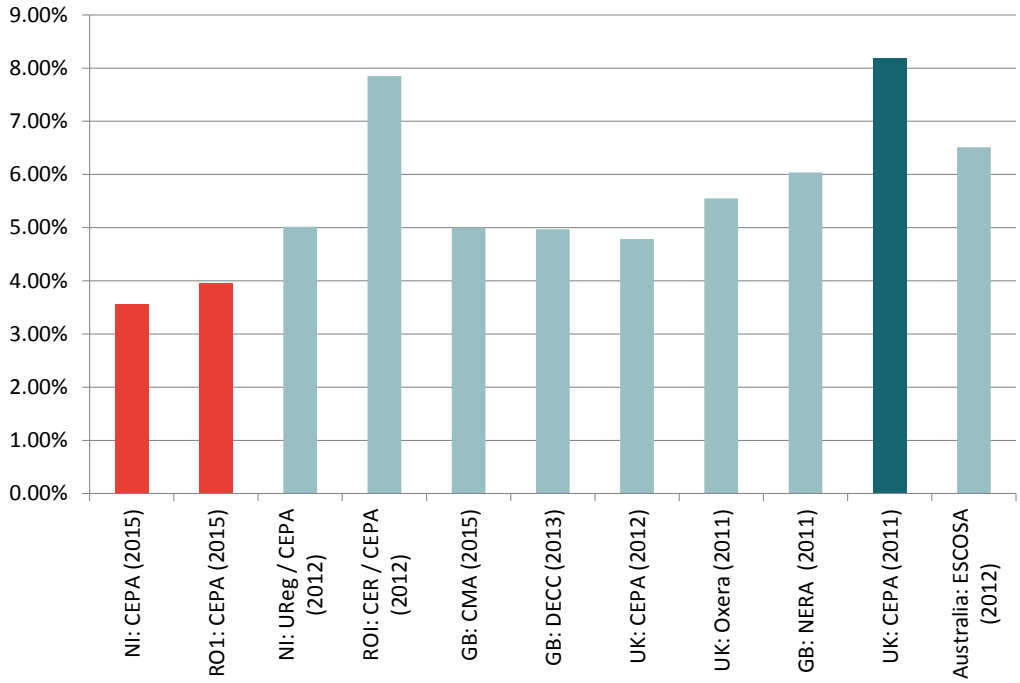


Source: Frontier Economics collection from a range of external sources

The chart above shows that the CEPA BNE pre-tax estimates are at least one percentage point lower than all of the relevant comparator estimates, and in some cases the CEPA estimates are around half of the other estimates.

Since we have looked at a range of different countries, each with different corporation tax rates, it is also informative to look at the difference in post-tax WACC estimates. A comparison on this basis is shown in the chart below.

Figure 8. Real post-tax WACC estimates



Source: Frontier Economics collection from a range of external sources

This chart further demonstrates the sizeable difference between the CEPA estimates and the relevant comparator estimates. The CEPA estimate for NI is 200 basis points lower than the average of the GB/UK/NI/ROI conventional technology figures that we have used in our comparison, while the CEPA estimate for ROI is 160 basis points lower than that average.

3.3 Findings and conclusion

Based on the factors that can affect the WACC, as identified earlier, we provide below a summary of the findings from this comparison.

- **Timing.** We recognise that there has been a decline in the WACC estimates in recent years, and as such we only included information from the recent past. We note that the most recent example from GB, the CMA's estimate of generation WACC as part of the Energy Market Investigation, is still at least one percentage point higher than the CEPA estimate in post-tax terms.

- **Technology.** In all but one example, we have selected estimates for the WACC of conventional thermal assets, and as such they are directly comparable to the CEPA BNE estimate. In the remaining case, we have used a 2011 CEPA estimate of the hurdle rate for offshore wind in the UK.

This example is almost three times the size of the CEPA BNE WACC estimate, which is a significant difference.

- **NI/ROI premium.** This analysis has shown that there appears to be a NI/ROI premium over GB in past estimates.

- **Regulation.** Where possible we chose unregulated WACC estimates to ensure comparability between the CEPA estimate and those in our study.

In conclusion, the 'top-down' benchmarking that we have conducted has demonstrated that the CEPA BNE estimate is far out of line from relevant WACC estimates, even from the last couple of years. This difference cannot be explained any of the factors that have a significant impact on the WACC.

The evidence suggests that the current CEPA estimate is around 150 to 250 basis points too low, and that an overall WACC of at least 6% is appropriate.

4 Overall assessment of the appropriate WACC for BNE costs

In this section we set out our judgement on the appropriate WACC for the BNE plant in NI and ROI, based on our 'bottom up' assessment (and cross-checking using our 'top-down' assessment). We also consider this estimate in the light of recent regulatory precedent, in particular, the CMA's recent assessment of generation WACC in GB.

Table 12. Assessment of the WACC for BNE 2016

	Republic of Ireland		Northern Ireland	
	Low	High	Low	High
Gearing	30.0%	30.0%	30.0%	30.0%
Cost of equity (post-tax, real)	**5.91%**	**5.91%**	**6.07%**	**6.07%**
Risk free rate	2.00%	2.00%	2.00%	2.00%
Equity risk premium	4.80%	4.80%	5.00%	5.00%
Asset beta	0.60	0.60	0.60	0.60
Equity beta	0.81	0.81	0.81	0.81
Cost of debt	**1.98%**	**4.44%**	**2.60%**	**4.96%**
WACC (vanilla, real)	4.73%	5.47%	5.03%	5.74%
WACC (pre-tax, real)	**5.32%**	**6.06%**	**6.09%**	**6.80%**
Midpoint (pre-tax, real)	**5.69%**		**6.45%**	

Note: we have used the current prevailing tax rates for the pre-tax WACC calculation: 12.5% in ROI and 20% in NI/UK.

Our 'bottom-up' analysis shows a pre-tax real WACC of 6.45% in Northern Ireland and 5.69% for the Republic of Ireland. This is is consistent with the low end of other generation WACC estimates we have reviewed.

By comparison, CEPA estimate a pre-tax WACCs of 4.46% for Northern Ireland and 4.52% for Republic of Ireland. Our analysis and other estimates of generation WACC both suggests these estimates are far too low.

For comparison, we set out our and CEPA's WACC estimates below alongside the CMA's recent estimate of generation WACC as part of the current Energy

Market Investigation. While we believe some of the CMA's parameter estimates are too low (in particular the risk-free rate and equity risk premium), this still highlights that CEPA's BNE estimate is low compared to recent precedent. This is particularly true given that generation investment in NI and ROI is perceived as higher risk than in GB, and therefore associated with a higher cost of capital.

Overall assessment of the appropriate WACC for BNE costs

Table 13. Comparison of key WACC estimates

	ROI (Frontier)		ROI (CEPA)		NI (Frontier)		NI (CEPA)		GB (CMA)	
	Low	**High**	**Low**	**High**	Low	**High**	**Low**	**High**	Low	**High**
Gearing	30.0%	30.0%	60.0%	60.0%	30.0%	30.0%	60.0%	60.0%	40.0%	20.0%
Cost of equity (post-tax, real)	**5.91%**	**5.91%**	**6.70%**	**7.83%**	**6.07%**	**6.07%**	**6.50%**	**7.75%**	**4.05%***	**4.90%***
Risk free rate	2.00%	2.00%	1.75%	1.75%	2.00%	2.00%	1.00%	1.00%	1.07%*	1.36%*
Equity risk premium	4.80%	4.80%	4.50%	4.50%	5.00%	5.00%	5.00%	5.00%	4.00%	5.00%
Asset beta	0.60	0.60	0.50	0.60	0.60	0.60	0.50	0.60	0.50	0.60
Equity beta	0.81	0.81	1.10	1.35	0.81	0.81	1.10	1.35	0.77	0.73
Cost of debt	**1.98%**	**4.44%**	**1.00%**	**3.00%**	**2.60%**	**4.96%**	**0.75%**	**2.25%**	**2.53%***	**4.29%***
WACC (pre-tax, real)	**5.32%**	**6.06%**	**3.66%**	**5.38%**	**6.09%**	**6.80%**	**3.70%**	**5.23%**	**5.17%***	**6.92%***
Midpoint (pre-tax, real)	**5.69%**		**4.52%**		**6.45%**		**4.46%**		**6.09%**	

Source: Frontier calculations. In the CMA case, we converted the CMA's nominal figures into real figures using the CMA's published figures for CPI inflation during the period studied (2007-2014); we have highlighted cases where we have made this conversion with an asterisk. It was not possible to fully replicate the headline CMA figures (i.e. the bold numbers) from the bottom-up CMA numbers. We have therefore presented the bottom-up numbers, and the headline figures converted from the nominal figures published by the CMA.

Overall assessment of the appropriate WACC for BNE costs

FRONTIER ECONOMICS EUROPE
BRUSSELS | COLOGNE | LONDON | MADRID

Frontier Economics Ltd 71 High Holborn London WC1V 6DA
Tel. +44 (0)20 7031 7000 Fax. +44 (0)20 7031 7001 www.frontier-economics.com