Appendix 10.4: Cost of capital

Contents

Introduction

1. The approach to assessing profitability, as set out in the Guidelines,[1] is to compare the profits earned with an appropriate cost of capital. In this appendix, we set out our estimate of the nominal pre-tax weighted average cost of capital (WACC) for the various elements of the energy value chain in Great Britain (GB), based on data for the period January 2007 to March 2014.

2. Our estimate of the WACC of a stand-alone electricity generator is between 8.2 and 10.0%, while a retail supply business would be entirely equity funded with a cost of equity of 9.3 to 11.5%.

Table 1: CMA estimates of the WACC for the elements of the energy value chain

	Generation	*Retail supply*
Real risk-free rate (%)	1.0	1.0
Nominal risk-free rate (%)	4.0	4.0
Equity risk premium (%)	4.0–5.5	4.0–5.5
Asset beta	0.5–0.6	0.7–0.8
Pre-tax Ke (%)	9.1–10.4	9.3–11.5
Pre-tax cost of debt (Kd) (%)	6.0–7.0	-
Gearing (%)	10.0–30.0	0
Tax rate (%)	27.0	27.0
Pre-tax WACC (%)	**8.2–10.0**	**9.3–11.5**

Source: CMA analysis.

3. We consider the above range to be a reasonable estimate of the cost of capital that would have been faced by a typical firm operating at the relevant stage(s) of the energy value chain in GB.

4. Five of the Six Large Energy Firms (Centrica, E.ON, RWE, Scottish Power, and Scottish and Southern Energy (SSE) provided the CMA with WACC estimates on a variety of bases. These are set out in detail in Annex A. We make reference to these estimates and the views put forward by these firms and others active in the GB energy sector as appropriate in this paper.

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[1] *Guidelines for market investigations: Their role, procedures, assessment and remedies (CC3).*

5. The remainder of this section sets out our methodology and the analysis we have conducted. As set out in the Guidelines,[2] we generally look to the capital asset pricing model (CAPM) when considering the cost of capital, and this is the approach we have adopted in estimating the cost of equity for the energy firms. We have estimated the cost of debt with reference to both the actual interest rates paid by the energy firms and corporate bond yields over the period.

General approach to estimating the WACC

6. There are several factors that we have taken into account in estimating an appropriate benchmark cost of capital for the various activities undertaken within the energy sector. These include:

   (a) how to estimate the WACC – use of the capital asset pricing model (CAPM);

   (b) which cost of capital provides an appropriate benchmark – specification of the basis of the WACC; and

   (c) over which time period should the cost of capital be measured – at the start of the relevant period, or an average for the relevant period?

Capital asset pricing model

7. The Guidelines highlight that we generally use the CAPM when considering the cost of equity since this is a widely understood technique with strong theoretical foundations.[3]

8. The CAPM relates the cost of equity $E[R_i]$ to the risk-free rate (R_{rf}), the expected return on the market portfolio (R_m), and a firm-specific measure of investors' exposure to systematic risk (beta or β) as follows:

$$E[R_i] = R_{rf} + \beta(R_m - R_{rf})$$

9. If a business were entirely funded by equity, the expected return on equity could be considered to be its 'cost of capital'. However, most firms are funded by a combination of both debt and equity, such that the appropriate cost of capital to consider is the weighted average cost of debt and equity. The WACC is given by the following expression:

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[2] *CC3*, Annex A, paragraph 16.
[3] *CC3*, paragraph 116.

$$WACC = E[R_i] \times E/(D+E) + K_d \times D/(D+E)$$[4]

10. Finally, the cost of capital must take into account the effects of tax on returns to capital providers. The returns to debt holders take the form of interest payments which are usually tax-deductible. The returns to equity holders (dividends), on the other hand, are taxed. Hence, where the cost of capital is expressed 'pre-tax', the cost of equity used must reflect the fact that the actual return to shareholders will be reduced by the rate of tax. We have estimated the cost of capital on a nominal pre-tax basis:[5]

$$\text{Pre-tax } WACC = [(1/(1-t)) \times E[R_i] \times E/(D+E)] + [K_d \times D/(D+E)]$$

Specification of the basis of the WACC

11. Our profitability analysis measures the returns earned by all sources of capital on the capital employed by the business. As these returns are measured before interest and/or tax is paid, they are not affected by the capital structure of the business.[6] The WACC of an individual business, on the other hand, is affected by its capital structure, ie the proportion of debt and equity used to finance the business. These financing choices may be driven by a number of factors, including the ability of the business to raise debt, the risk appetite of equity holders and the relative costs of debt and equity financing. In our analysis, we use the WACC as a benchmark for the level of 'normal' profits. As a result, we consider that it is appropriate to use the same WACC as the benchmark for all operators, rather than estimating a firm-specific cost of capital for each operator.[7]

12. In coming to a view on this benchmark WACC, we have sought to reflect a sustainable level of gearing, cost of equity and cost of debt that a hypothetical stand-alone operator in GB would incur when undertaking the relevant activities. Where possible, therefore, we have used GB (or UK) benchmarks and tailored the variable elements[8] of the cost of capital to reflect both the nature of the activities under consideration and the fact that some of the benchmarks we have used to estimate the WACC relate to multinational firms with a broad range of activities, ie may face different risks from a stand-alone GB firm.

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[4] Where D is debt, E is equity and K_d is the cost of debt.
[5] This avoids the need to adjust nominal financial information to remove the effects of inflation.
[6] The capital structure affects how earnings before interest and tax is divided between the various providers of capital.
[7] This approach ensures that all firms in an industry are treated equally.
[8] These are the beta value, gearing and cost of debt.

13. RWE expressed concern with this approach, noting that by selecting a particular capital structure to include in its WACC calculation the CMA may discriminate against certain firms. It put forward the view that it would be inappropriate to make a finding of excessive profitability on the basis of choosing a particular gearing, when a firm may have a different but still appropriate level of gearing. We do not consider that RWE's concerns in this respect are well founded. Our approach to estimating the WACC is based on the observed level of gearing and associated cost of debt in the industry and we would expect, therefore, that it would represent (at least approximately) the efficient capital structure for a given industry. In our view this is the appropriate benchmark. Although some firms may have chosen different capital structures with potentially higher WACCs, we do not consider that these costs represent the competitive benchmark.

14. We have measured the profitability of the energy firms on two separate bases: *(a)* stand-alone generation of electricity, and *(b)* stand-alone retail supply of gas and electricity. We note that we would expect there to be variations in beta values, gearing and cost of debt across generation and retail. Therefore, we have estimated two separate WACCs, one for the generation operations and one for the retail operations.

Relevant time period

15. We are analysing the profitability of the firms over the period between 2007 and 2013 (firms' results for FY07 to FY13). When a cost of capital is set for regulatory purposes, it is generally forward looking. In a market investigation, in contrast, we are looking backwards to understand whether the profits made by the firms have exceeded the cost of capital over the relevant period. RWE put forward the view that each of the component parameters of the WACC should reflect the reasonable expectations of the firms over the relevant period and not an ex post assessment of the actual outturn as at 2013. 'For example, for the risk-free rate, or the equity risk premium, the energy firms would have based their investment decisions on the reasonable expectations of the market at the time.' We agree that this is the correct approach. We have not sought, therefore, to estimate the WACC at a particular point in time but rather we have considered the average cost of capital for the relevant period as a whole.

CMA estimation of WACC

16. This section sets out the analysis that we have undertaken in order to estimate the components of the WACC calculation, which includes both generic and industry-specific components. The former comprise the risk-free

rate (RFR), the equity risk premium (ERP) and the tax rate; the latter comprise beta, cost of debt and gearing. We note that the former are common to all elements of the value chain, while the latter vary depending on whether the firm operates in generation, retail supply or both.

17. In conducting our cost of capital analysis, we have had reference to our price determinations for Bristol Water, which was undertaken in 2009/10, and for NIE, which was undertaken in 2013, ie during the relevant period for our analysis.[9]

Risk-free rate

18. In order to estimate the risk-free rate applicable over the period of our investigation, we have had reference to two sources. The first is index-linked gilt yields, which have negligible default and inflation risk. The second source is nominal gilt yields, which also have negligible default risk but which do have inflation risk (and, therefore, should contain an inflation risk premium). We observe that our profitability analysis measures the nominal returns made by energy firms, rather than real returns.

19. We consider the yields on long-maturity gilts to be most relevant to the RFR in the cost of equity since equities also have long (indefinite) maturity.[10] Figure 1 shows the index-linked yield curve at the start and end of the relevant period, as well as the seven-year average (ie covering the whole period). For maturities of 15 years and more, the yield curves are between 0 and 1.5% with an average of just over 0.5%. Shorter-dated yields have fallen significantly over the last seven years, reflecting action by the authorities to address the credit crunch and recession, while yields on longer-dated gilts have been more stable over the period.

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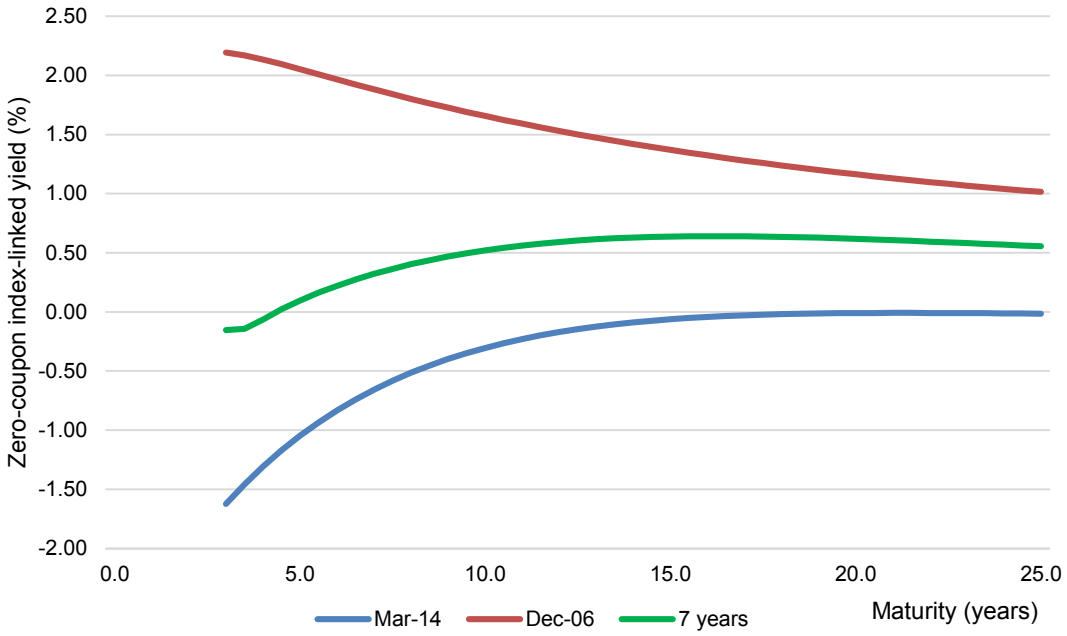
[9] Bristol Water plc: *determination on a reference under section 12(3)(a) of the Water Industry Act 1991*, August 2010. *Northern Ireland Electricity (NIE) price determination*.

[10] In previous reports in the last ten years, we paid attention to distortions in the index-linked markets that may affect the shape of the yield curve. In Bristol Water (2010), the Competition Commission (CC) noted that shorter-dated index-linked yields were affected by action by the authorities to address the credit crunch and recession and were therefore less relevant to estimating the RFR. In inquiries prior to 2010 the CC put less weight on longer-dated maturities, noting possible distortion from pension fund asset allocation policies. As we explained in NIE, the effects of monetary policies and pension fund dynamics are increasingly well understood by the markets. Consequently we expect the market prices of index-linked gilts to incorporate effectively expectations of the effects of these factors and therefore to provide a reasonable guide to future returns.

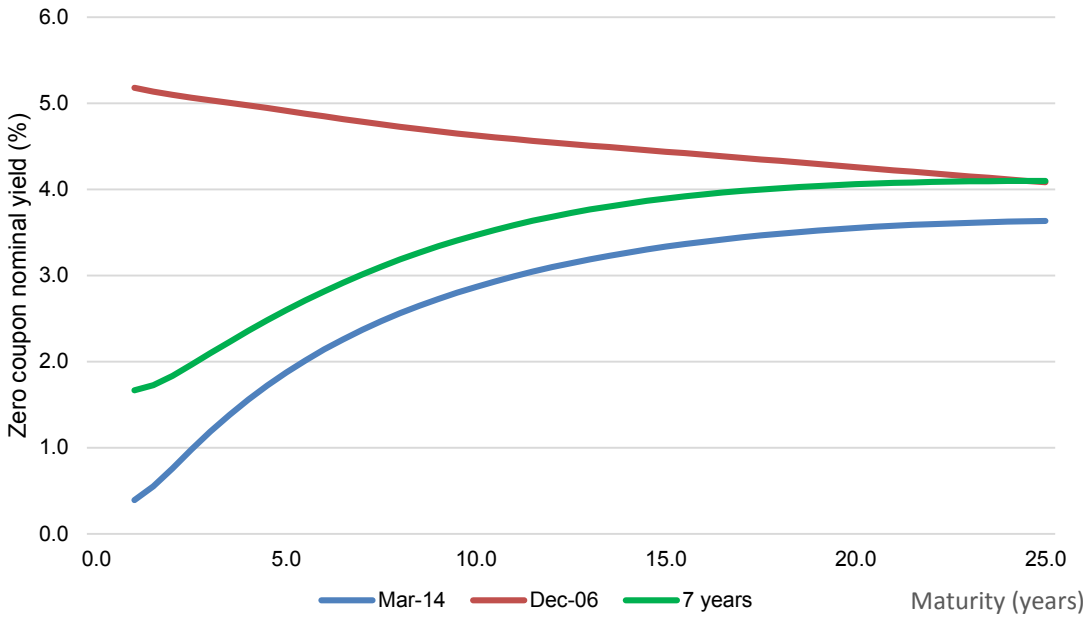
Figure 1: Yield curves on UK index-linked gilts, 2007 to 2014



Source: Bank of England, real spot yield curve data.
Note: The three lines show yields on 31 December 2006, 31 March 2014, and the average yields covering the seven and a quarter year period between January 2007 and March 2014.

20. Figure 2 shows nominal gilt yields at the start and end of the relevant period, as well as the seven-year average (ie covering the whole period). For maturities of 15 years and more, the yield curves are between 3.3 and 4.5% with an average of 4%. A similar pattern of declining yields on shorter maturities can be seen on these nominal gilts.

Figure 2: Nominal yield curves on UK gilts, 2007 to 2014



Source: Bank of England, nominal spot yield curve data.
Note: The three lines show yields on 31 December 2006, 31 March 2014, and the average yields covering the seven and a quarter year period between January 2007 and March 2014.

21. In assessing this evidence, we have had regard to the nature of the benchmark that we require, ie a reasonable, nominal return on capital over the seven-year period from January 2007 to March 2014. We observe that an investor at the start of this period would have had regard to a higher gilt yield (real or nominal) than an investor towards the end of the period, although the difference is less material when considering long-dated gilts. On this basis, we consider that a reasonable nominal RFR for the period is 4%.[11] The average yield on long-dated index-linked gilts has been approximately 0.5% over the period. However, in the NIE price determination we used a real RFR of between 1 and 1.5%, which was considerably above rates on long-duration index-linked debt, in order to allow for the possibility that rates might rise during the remainder of the price control period. In this case, we are not seeking to determine an appropriate cost of capital for a future period and therefore do not face the uncertainties associated with forecasting. We have historic information on which to base our estimates. This could provide a reason for using a lower real RFR.

22. However, we have also taken into account the fact that the yields observed on index-linked gilts are likely to be affected by the imperfections associated with the RPI as a measure of underlying inflation. We note the historical gap

[11] We note that this is consistent with the upper end of the estimates used for the nominal RFR in both the private healthcare and the aggregates market investigations.

between RPI and Consumer Price Index (CPI) measures of inflation of around 0.5% between 2005 and 2013.[12] To the extent that the CPI better reflects underlying inflation, measures of the apparent riskless rate of return taken from index-linked gilt yields may be distorted as a result of that gap. This may be a factor behind negative short-term real yields. In our NIE decision, we noted that, given that the regulated asset base of the company was also indexed by the RPI, we did not need to adjust our estimate of the RFR for this effect. However, in this investigation, the financial performance of the companies is likely to have been affected by the general rate of inflation in the economy, which we consider to be most accurately measured by the CPI.

23. Therefore we have considered two approaches; firstly to adjust the historic yield on long-dated ILGs (0.5%) upwards to take account of the gap between RPI and CPI (also 0.5%) in the period 2007 to 2013; this produces an estimate of the real RFR of 1%. Secondly we consider the nominal yield on long-dated gilts (approximately 4%) and deduct the CPI over the period. Between January 2007 and March 2014, the CPI averaged 2.9%. This produces a real RFR estimate of 1.1%. [13] (In theory we would also need to subtract an estimate of the inflation risk premium over the period, however we are not aware of any reliable estimate for this purpose). Both approaches yield a real RFR of around 1%.

24. RWE stated that we should have reference to both RPI and CPI in coming to a view on the real RFR since:

    (a) RPI inflation was used as the benchmark for UK index-linked bonds, which suggested that it was the key indicator of inflation that investors used to guide investment decision and hence more consistent with their opportunity costs. RWE noted that the CMA used a real risk-free rate based on UK index-linked bonds with an allowance for RPI in both the Bristol Water and NIE decisions;

    (b) RPI was widely used as the inflation benchmark by regulators in the UK, including in the economic regulation of energy assets such as distribution and transmission networks. Hence, the use of RPI to calculate real returns was widely accepted in UK regulation;

    (c) the CMA had not provided evidence to support its view that CPI was a more appropriate measure of underlying inflation for the purposes of a

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[12] See *Bank of England inflation report 2014*, p34.
[13] The 2.9% average is the same whether estimated on a geometric or arithmetic basis. We note that this range is consistent with the real RFR that would result from adding the difference between the RPI and the CPI (0.5%) to the average yield on index-linked gilts (of 0.5%), ie 1%.

competition investigation and specifically the energy industry, which as noted above did use RPI in the pricing of certain long-term contracts; and

(d) RPI was widely used by valuation practitioners.

25. Similarly, SSE noted that the nominal risk free rate of 4% was below that implied in the various airports, Bristol Water and NIE price redeterminations undertaken during the relevant period. This could be seen by converting the real risk-free rates in those determinations into nominal terms by applying the inflation assumptions that the CC used in each case.

26. As RWE recognises in its response, CPI is the official measure of inflation in the UK. RPI has been discontinued as a national statistic for a number of reasons, one of which is due to the fact that it is estimated on the basis of the statistically flawed Carli formula.[14] We recognise that RPI is used as a benchmark rate of inflation for index-linked gilts and that it is widely used in price determinations for regulated sectors, including by the CMA in the recent Bristol Water and NIE appeals.[15] However, we have explained in paragraphs 21 and 22 our reasons for taking a slightly different approach in coming to a view on the appropriate RFR in the context of a market investigation. In relation to RWE's argument regarding the suitability of CPI for the energy sector, we note that the return that investors require in order to invest in a risk-free asset is a general benchmark, with the same RFR relevant to all potential investment options. It is not, therefore, affected by the specific rate of cost inflation in the energy (or any other) sector. As a result, we consider the appropriate rate of inflation to use is CPI rather than RPI.

Equity risk premium

27. The ERP is the additional return that investors require to compensate them for assuming the risk associated with investing in equities rather than in risk-free assets. When seeking to understand what the ERP was over a historic period of time, it is necessary to identify the returns which investors expected to make on the market and deduct the relevant RFR (as estimated above).

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[14] See 'UK Consumer Price Statistics: A Review, Paul Johnson, January 2015'. This report made a number of recommendations, including:

> The Authority and ONS should make it clear to users that the RPI is not a credible measure of consumer price change. The RPI should not be used for new contracts. Taxes, benefits and regulated prices should not be linked to the RPI. The RPI should also not be used as the measure of inflation when comparing living standards over time, at least for recent years where better consumer price indices are available. The issuance of index-linked gilts is more complex, but government should move away from selling gilts linked to the RPI, subject to consultation and assurance about the demand for CPI or CPIH linked gilts.

[15] We note that there is an argument for consistency in approach from one price determination to the next in regulated industries. In the case of a market investigation, which is a one-off inquiry into a sector, the same considerations do not necessarily apply and we consider that there are stronger arguments for updating our approach over time in response to new evidence on the most appropriate measures of inflation etc.

28. There are two types of approach that can be used to estimate the ERP. Historical methods seek to derive the ERP from a long run of data on realised returns on equities. Forward-looking approaches seek to estimate the expected ERP based on either the reported expectations of market participants or the ERP implied in asset prices at the start of the period.

Historical approaches (ex post and ex ante)

29. The key assumptions behind the historical ex post approach are that expected returns remain constant over time and that average realised returns reflect the expected return. Dimson, Marsh and Staunton estimated the average ERP for a number of countries, including the UK, on the basis of equity and gilt yields over the past 114 years.[16] These ERPs are estimated as the difference between the real return on equities and the real return on gilts over the period.[17]

30. Table 2 shows the geometric and arithmetic average returns on UK equities, bonds and bills over the period between 1900 and 2013, together with the historic equity risk premium implied by these returns.[18]

Table 2: Real returns on UK equities and government debt, 1900 to 2013

		%
	Geometric mean	*Arithmetic mean*
UK real returns		
Equities	5.3	7.2
Bonds	1.4	2.3
Bills	0.9	1.1
ERP		
Bonds	3.9	5.2
Bills	4.4	6.1

Source: Dimson et al. (2014) Credit Suisse Global Investment Returns Sourcebook.

31. We note that the arithmetic mean reflects the returns that an investor could expect to make in any given year, while the geometric mean reflects the compound returns that an investor would have made if they had invested over

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[16] *Credit Suisse Global Investment Returns Sourcebook 2014*. As Dimson et al. explain (p7), 'To understand risk and return, we must examine long periods of history. This is because asset returns, and especially equity returns, are very volatile. Even over periods as long as 20 years or more, we can still observe 'unusual' returns.' On this basis, we have used the full 114-year mean equity returns estimates in our analysis. The advantage of this approach is also that the larger sample size (ie number of years), increases the accuracy of the estimates – the standard errors of the estimations are reduced, narrowing the confidence interval.

[17] The formula used to estimate the ERP is: ((1+ Equity rate of return) / (1+ Riskless return)) – 1, which is approximately equivalent to deducting the riskless returns from the returns on equities. Dimson et al. categorise 'gilts' into two groups for the purposes of their analysis; shorter-dated 'treasury bills' and longer-dated 'treasury bonds'. The former have maturities of up to ten years, while the latter have an average maturity of 20 years. The difference between 'bond' and 'bill' returns is referred to as the 'maturity premium'.

[18] We note that the real global market returns over the 1900 to 2013 period are very similar to those of the UK, with a geometric mean return of 5.2% and an arithmetic mean return of 6.7%.

the full 114-year period covered by the Dimson et al. dataset. It is usual to quote figures for the average of one-year returns but investors in the equity market usually expect to invest in the market for longer than a year. As the holding period increases, the expected return declines from the arithmetic mean towards the geometric mean. Therefore, in coming to a view on the appropriate market return, we have had reference to the range of mean returns (geometric to arithmetic), ie 5.3 to 7.2%.

32. An alternative approach to identifying the ERP suggested by Fama and French is to estimate directly the market returns expected by investors historically (ie ex ante returns). They do this by using average dividend yields and earnings growth rates to measure the expected rate of capital gain.[19] Using the full run of historical data for the UK, this suggests an underlying market return of 5.5%.[20]

33. Fama and French's work on US securities provides evidence of a fall in expected returns over time, with expected returns being lower since 1950 than before. The statistical evidence for the UK is less extensive[21] but, as illustrated in Figure 3, the dividend yield as of the start of the relevant period (of about 3.5%) was below the historical average (4.5%). Unless future dividend growth is higher than in the past, this would suggest that expected returns are about 1% lower than the past average, implying a market return of about 4.5% (using Barclays data).[22]

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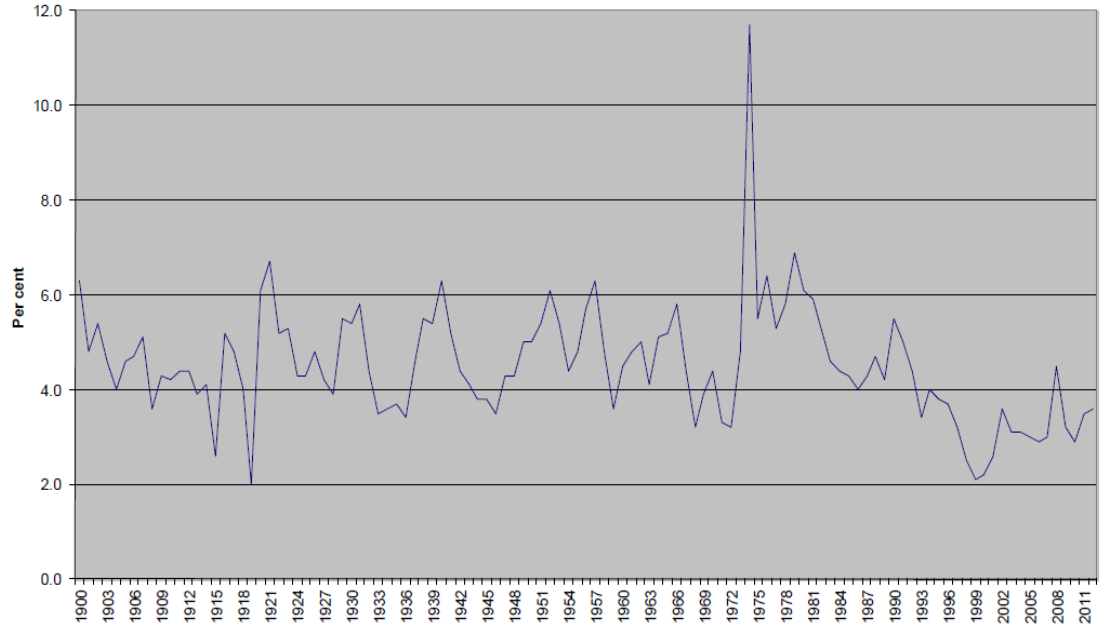
[19] EF Fama and KR French (2002),'The equity premium', *Journal of Finance*, April.
[20] This result is derived from an average dividend yield of 4.5% and dividend growth of 1% a year (Barclays data). Fama and French note that their estimates of the ERP are much lower than those derived from the average stock return. They suggest that achieved returns may have been higher than expected returns over the period between 1951 and 2000 due to a decline in discount rates that produced a large unexpected capital gain for investors.
[21] Two papers that find evidence of a reduction in the expected market return or ERP for the UK (albeit at different times) are Buranavityawut, Freeman and Freeman (2006) 'Has the equity premium been low for 40 years?', *North American Journal of Economics and Finance* 17, pp191–205; and Vivian (2007) 'The UK equity premium, 1901–2004', *Journal of Business and Financial Accounting* 34(9–10), pp1496–1527. The first paper suggests that the expected equity premium may have fallen in the 1960s in the UK and other countries, while the second paper suggests that there was a permanent decline in the UK market dividend-price ratio during the early 1990s.
[22] These figures do not take into account payments to shareholders other than dividends, eg share repurchases.

Figure 3: Dividend yield for UK market (Barclays data)



Source*:* Barclays equity gilt study, 2013.

34. Dimson et al. (2014) sought to infer what investors may have been expecting, on average, in the past, by separating the historical equity premium into elements that correspond to investor expectations and elements of non-repeatable good or bad luck. These elements include the mean dividend yield, the growth rate of real dividends, the expansion of the price/dividend ratio and change in real exchange rates. Dimson et al. concluded that the worldwide historical premium was larger than investors were likely to have anticipated because of factors such as unforeseen exchange rate gains and unanticipated expansion in valuation multiples. Noting that dividend yields are lower than in the past, Dimson et al. inferred that, for the world index, a forward-looking risk premium (over treasury bills) would be 4.5 to 5%. Given a difference of 1% between average return on bills and ERP (see Table 2), this implies an expected return of 5.5 to 6%.[23]

Forward-looking approaches

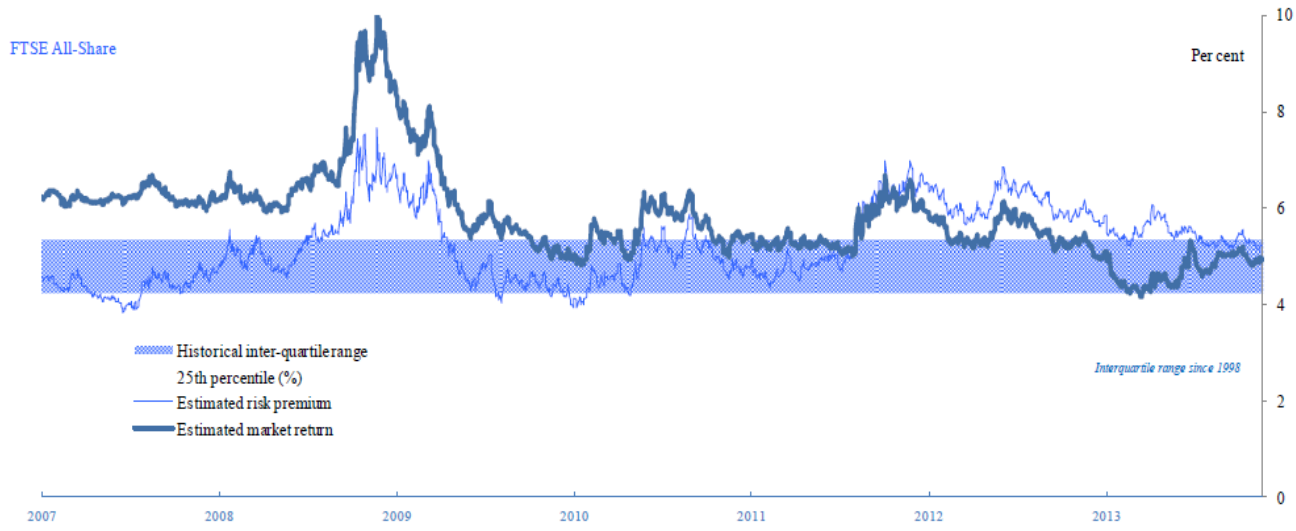
35. The ERP is also commonly estimated using projected dividends from analysts' forecasts (which extend out by four or five years) and a longer-term dividend growth rate. The expected return is then the discount rate at which the present value of future dividends is equal to the current market price. A limitation of this approach is that it is necessary to make an assumption about future long-term growth of dividends (which has a major effect on the

[23] *Credit Suisse Global Investment Returns Sourcebook 2014*, pages pp29–34. The 4.5 to 5% range is the arithmetic mean. The equivalent geometric mean is 3 to 3.5%.

calculation since dividends beyond year four or five account for a large part of present value at plausible discount rates).

36. Figure 4 shows estimates of ERP using this methodology published in an article in the *Bank of England Quarterly Bulletin*. These estimates are based on the assumption that the future long-term growth in dividends per share is equal to an estimate of the potential growth of the economy. However, the authors of the article noted that this choice of future long-term growth rate is essentially arbitrary.[24] The estimates in Figure 4 suggest that since 2007 the expected ERP has fluctuated around 5%, towards the upper end of the historical inter-quartile range of between 4.25 and 5.3%.[25] We attempted to calculate the expected market return implied by these estimates of the ERP by adding the yield on zero-coupon ten-year gilts. Calculated on this basis, since the 2008 financial crisis the market return has fluctuated around 6%. It has declined markedly following the financial market turmoil of 2009 to 5% or less. Indeed, the Bank of England's November 2013 *Financial Stability Report* notes rising equity prices, improved earnings expectations, and a fall in equity risk premia towards long-term average levels.[26]

Figure 4: Estimated ERP and approximate implied real market return



Source: Bank of England and CMA calculations.

37. We agree that it is essentially arbitrary to assume future long-run growth in dividends per share equal to potential economic growth. Indeed, we see empirical support for expecting long-run growth in dividends per share to be less than potential economic growth. The historical growth rate in real

[24] M Inkinen, M Stringa and K Voutsinou (2010) 'Interpreting equity price movements since the start of the financial crisis', Q1.
[25] Calculated by the Bank of England based on a longer time series of data between 1998 and 2013.
[26] *Financial Stability Report*, p8 and Chart 1.6.

dividends for the UK from the Credit Suisse/Dimson et al. data is only 0.5% and around zero using the Barclays data – this is significantly less than real UK economic growth over the same period (1900 to 2010) of 1.9%.[27] It is also the case that growth in dividends per share has been significantly less than economic growth in more recent periods. Since 1950, growth in dividends per share has been 1.1%, compared with 2.4% for GDP growth, while, since 1980, growth in dividends per share has been 1.6%, compared with 2.3% for GDP growth.[28]

38. Bearing in mind these points and also that analysts' forecasts may be subject to upward bias, we consider that the approximate 5% ERP and 5 to 6% market return suggested by figure 4 are likely to be at the upper end of expected returns.

Views of the parties

39. RWE put forward the view that the CMA should take account of regulatory precedent (including that of the CMA itself) when coming to a view on the ERP. It noted that in its strategy decision for RIIO-ED1 in March 2013, Ofgem determined a range for the ERP of between 4.75 and 5.5%, while in both the Stansted and Bristol Water price determinations, as well as the private healthcare market investigation, the CMA had used a range of market returns of between 5 and 7%. In addition, RWE highlighted that Ofwat used an ERP of 5.5% in its PR14 price control review and that it considered that more weight should be placed on the arithmetic mean rather than the geometric mean when evaluating observed market returns.

40. SSE argued that the CMA's approach did not reflect the expectations of investors during the 2007 to 2013 period but rather was using out-turn returns over the relevant period, which was not consistent with the approach set out in paragraph 15. SSE put forward the view that, in order to address this inconsistency, the CMA should put more emphasis on the estimated total market return of 7% as used in the Heathrow/Gatwick, Stansted and Bristol Water price determinations, since these were more reflective of expectations over the relevant period than the NIE price determination (where a market return of 6.5% was used).[29]

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[27] *Credit Suisse Global Investment Returns Sourcebook 2013*, Table 11. SH Williamson (2015) 'Annualized growth rate of various historical economic series'.
[28] A large body of literature suggests that there may be a tendency for analysts' forecasts to overreact to changes and on average to be too optimistic, eg WFM DeBondt and RH Thaler (1990) 'Do security analysts overreact?', *American Economic Review* 80, pp52–57.
[29] The airport price determinations covered the 2008 to 2013 period; the Bristol Water price determination covered the 2010 to 2015 period; and the NIE price determination covered the 2012 to 2017 period.

CMA discussion

41. The interpretation of the evidence on market returns remains subject to considerable uncertainty. Historic approaches (ex post and ex ante) indicate a market return of between 4.5 and 7.2%, while forward-looking approaches indicate a market return of between 5 and 6%. In the recent NIE determination, we came to the view that the appropriate market return was between 5% and an upper limit of 6.5%. We explained that, in applying the CAPM, we seek to derive the expected return on the market. The 7% upper limit used in previous regulatory inquiries had been based on the approximate historical average realised return. However, we noted that past realised returns were not necessarily the same as the expected return on the market, even over long time horizons, and that attempts to estimate the historical expected ex ante return suggested that this was considerably lower than the realised return.[30] As a result, we concluded that it was appropriate to move away from this 7% upper limit based on historical ex post realised returns and place greater reliance on ex ante estimates derived from historical data that tend to support an upper limit of 6.5%. On this basis, we did not agree with RWE's and SSE's argument that the 7% market return used in the various airports and Bristol Water price determinations was a more relevant guide to market expectations over the period, since as explained above, this was based on historical realised returns rather than expected market returns. Therefore, we consider that an appropriate range of market returns is between 5% and 6.5%. Together with a real RFR of around 1%, this range implies an ERP of between 4 and 5.5%.

Tax rate

42. The corporation tax rates applicable over the period are set out in Table 3. For the purpose of estimating the WACC, we have used an average of the tax rates over the period of 27%.

[30] In addition, we observed that historical returns necessarily incorporate, among others, revisions in expectations for future cash flows and discount rates. DMS (2007) attempted to address this issue directly by decomposing past realised returns. We shared its view that some elements of the return, in particular the historical expansion in valuation ratios, is unlikely to be repeated in the future. Finally, we noted that a forward-looking expectation of a return on the market of 7% did not appear credible to us, given economic conditions observed since the credit crunch in 2008 and lowered expectations of returns.

Table 3: UK corporation tax rates

%

2006/07	*2007/08*	*2008/09*	*2009/10*	*2010/11*	*2011/12*	*2012/13*	*2013/14*
30	30	28	28	28	26	24	23

Source*:* HMRC.

Equity betas

43. The beta of an asset measures the correlation between the volatility of the returns on the asset and the returns on the market as a whole, or the exposure of the firm to systematic or 'non-diversifiable' risk. It is in return for assuming this (market) risk that investors require an (equity risk) premium over the risk-free return.

44. The beta value of a listed firm can be directly estimated as the covariance between the stock's returns and the market's returns, divided by the variance of market returns. However, when estimated in this way, the beta value reflects the full range of activities undertaken by a listed business and, as a result, may differ from the beta of the relevant activities for the purposes of our investigation.

45. Within a CAPM framework, changes in gearing affect equity betas. Hence, it is necessary to adjust for gearing differences in order to make comparisons between equity betas. We do this by calculating the asset beta, ie the beta at zero gearing. In this section, we first set out the range of beta estimates that we have collected on a range of listed energy companies. Then, we discuss the extent to which we consider the activities of these firms to be representative of those of our hypothetical stand-alone GB operator and, therefore, the extent to which their beta values are likely to be comparable.

Beta estimates

46. The betas of the listed companies are shown in Table 4. We have estimated these on both a monthly and a quarterly basis.[31] This approach follows the research findings of Gilbert et al. which show that monthly and quarterly betas

[31] Betas have been estimated for the period between January 2007 and March 2014 when information is available for the full period. In some cases, companies have been listed for a shorter period of time, in which case betas have been estimated since the date of listing. Beta estimates are based on the covariance between the 'excess' total return on each company's shares and the 'excess' total return on the relevant index (in each case assuming the reinvestment of dividends. Note that the 'excess' return is the realised return less the RFR, taken to be 1% for the purposes of this calculation. We have not applied any adjustments to the beta values, eg mean reversion.

are generally more reliable than those estimated on the basis of high frequency data, ie daily or weekly betas.[32]

47. The Six Large Energy Firms which are active in GB have an average asset (or unlevered) beta of approximately 0.5 to 0.6, with a range of between 0.24 and 0.75. We observe that both Centrica and SSE have slightly lower beta values than the other four firms, with the latter averaging 0.55 to 0.70 (on a quarterly and monthly basis, respectively). The asset beta values for the other, non-GB vertically integrated energy firms and for firms which mainly focus on generation are very similar, averaging around 0.5.

Table 4: Equity and asset betas of energy firms

Company	*Levered beta*		*Unlevered beta**	
	Monthly	*Quarterly*	*Monthly*	*Quarterly*
Six Large Energy Firms				
Centrica plc	0.47	0.46	0.42	0.41
SSE plc	0.46	0.31	0.36	0.24
EDF SA	1.05	0.93	0.75	0.67
E.on SE	0.97	0.70	0.70	0.50
Iberdrola SA†	1.01	0.85	0.66	0.55
RWE AG	0.86	0.59	0.67	0.45
Average			***0.59***	***0.47***
VI firms (non-GB)				
Enel S.p.A.	0.86	0.99	0.41	0.47
Gas Natural SA	0.77	0.76	0.49	0.49
EnBW AG	0.32	0.35	0.25	0.27
Verbund AG	0.72	0.58	0.54	0.44
Fortum Oyj	0.77	0.95	0.59	0.72
Contact Energy Limited	0.89	0.83	0.76	0.70
TrustPower Limited	0.39	0.34	0.32	0.28
NRG Energy Inc	0.78	1.12	0.42	0.60
Origin Energy	0.57	0.34	0.45	0.27
AGL (Australian Gas Light Co)	0.43	–0.12	0.38	–0.11
Average (excl. AGL)			***0.47***	***0.47***
Generation firms				
GDF Suez	0.77	0.64	0.54	0.45
Drax plc	0.42	0.35	0.40	0.34
AES Corp	1.33	1.56	0.60	0.71
American Electric Power Corp	0.51	0.54	0.33	0.35
Calpine Corp	1.19	1.56	0.63	0.82
Average			***0.50***	***0.53***
Energy retailers				
Telecom Plus plc	0.01	–0.33	0.01	–0.33
Good Energy	0.61	–1.71	0.57	–1.60
Just Energy	1.30	1.00	1.18	0.91
Crius Energy Trust	–0.58	1.44	–0.58	1.44

Source*:* Bloomberg data, CMA analysis.
*Betas have been unlevered using the following formula: Unlevered Beta = Levered Beta / (1 + ((1 – Tax Rate) x (Debt/Equity))), where the tax rate used is the average statutory corporate tax rate in the country in which each firm has its

[32] T. Gilbert, C Hrdlicka, J Kalodimos and S Siegal (2014) 'Daily data is bad for beta: Opacity and frequency-dependent betas', *Review of Asset Pricing Studies*.

headquarters. The tax rates used are set out in Annex B. The levered beta is also called the equity beta; the unlevered beta is also called the asset beta.
†Iberdrola SA acquired Scottish Power in 2007.

Comparability of firms

48. For the purposes of our profitability analysis, we wish to identify appropriate beta values for *(a)* a stand-alone GB electricity generator; and *(b)* a stand-alone GB electricity and gas retail supplier. Centrica put forward the view that using the betas of diverse and vertically integrated businesses may be misleading when seeking to estimate the WACC of a stand-alone business – particularly in retail supply – because the former will benefit from diversity in their operations and hence will not be comparable.

49. We consider that there are two main dimensions to take into account in determining the comparability of the betas of the firms covered in Table 4:

    (a) The geographical scope of operations, including whether the firms are active in GB and the extent to which they are diversified across a number of different countries.

    (b) The type and range of activities undertaken by the firms, including whether they are vertically integrated and whether they also undertake regulated business, such as owning distribution networks.

50. Table 5 sets out the proportion of revenues and profits earned by the Six Large Energy Firms in the UK and overseas, as well as the countries in which they have operations. It shows that SSE and Centrica have the greatest relative exposure to GB, with the majority of their activities here. SSE is the most heavily GB-focused firm with operations in GB and Ireland (only), while Centrica has around two- thirds of its business in the UK. In contrast, EDF Energy only generates around 12 to 13% of its sales and profits in the UK, with the majority of its operations in France. E.ON and RWE derive a similarly low proportion of their revenues and profits from their GB operations.

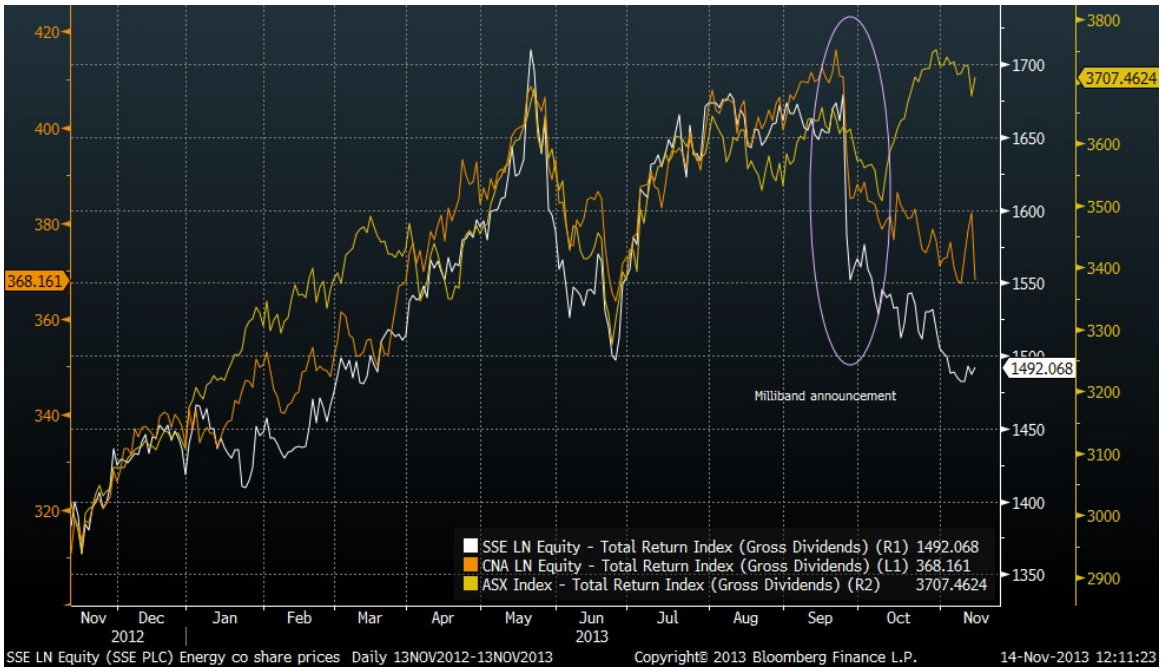
Table 5: Breakdown of company revenue and profits by location

Company	*Proportion of revenue*		*Proportion of operating profits*		*Countries with business presence*
	UK	*Overseas*	*UK*	*Overseas*	
Centrica*	c.2/3rd	c.1/3rd	c.2/3rd	c.1/3rd	UK, US, Netherlands, Norway, Canada, Trinidad & Tobago
EDF SA†	13%	87%	12%	88%	France, UK, Italy, Austria, Switzerland, Belgium, Hungary, Poland, Russia, China, US, Brazil, Vietnam, Laos
E.ON‡	c.10%	c.90%	c.5%	c.95%	Germany, UK, Spain, Italy, Hungary, Sweden, Czech Republic, Slovakia, Turkey, Brazil, Russia, US, France, Netherlands, Belgium, Poland, Denmark, Romania, Portugal
Iberdrola§	30%	70%	35%	65%	Spain, Portugal, UK, US, Brazil, Mexico
RWE¶	18.8%	81.2%	3.6%	96.4%	Germany, UK, Netherlands, Belgium, Czech Republic, Poland, Austria, France, Spain, Portugal, Slovakia, Slovenia, Romania, Turkey, Hungary, US, Italy, Singapore
SSE#	97%	3%	n/a	n/a	UK, Ireland

Source: Company annual reports 2013/2014.
*The Centrica *Annual report* 2013 (p99) indicated that just over 57% of revenues were derived from UK operations, and just over 27% from overseas operations, with the remaining 16% coming from a mix of UK and overseas activities. Similarly, the annual report indicated that 47% of adjusted operating profits came from UK operations, with 10% from overseas operations and 43% from a mix of UK and overseas operations. Hence the 2/3rds/1/3rd split is an approximate estimate of the overall split of total revenues and total operating profits.
†EDF Energy *Annual report* 2014, pp3&17. The UK proportion highlighted is for EDF Energy. 'Overseas' includes the results of EDF Trading, which will include an amount for UK revenues and profits.
‡E.ON *Annual report* 2013, p190. Note figures are for E.ON's supply activities only. While it is not possible to separate out E.ON's UK generation and trading revenues and profits from those earned in other territories, supply revenues and profits can be identified.
§Iberdrola *Annual report* 2013, p81.
¶RWE *Annual report* 2013, pp64&193. 2013 proportion of revenue consists of GenCo UK (€903m) and Supply UK (€9,259m) divided by Total RWE (€54,070m). 2013 proportion of operating result consists of GenCo UK (€-76m) and Supply UK (€290m) divided by Total RWE (€5,881m). These figures exclude UK Renewables, whose numbers are not separately disclosed in the RWE AG *Annual report*.
#SSE *Annual Report* 2014, p109.

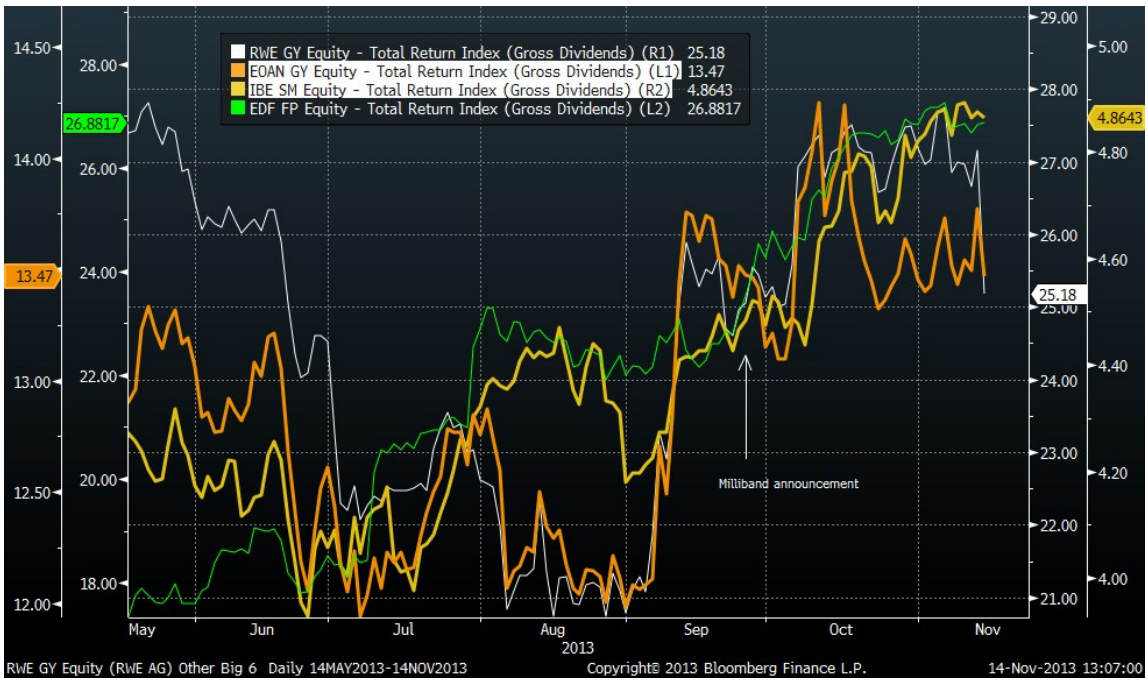
51. This differing relative exposure to the UK can also be seen in the responsiveness of the firms' share prices to 'shocks' to the sector in the UK. For example, on 24/25 September 2014 Ed Miliband announced a potential energy prize freeze in the case that the Labour Party won the General Election. Figures 5 and 6 show the impact of this announcement on the share prices of the Six Large Energy Firms. The share prices of Centrica and SSE underperformed the all-share index by around 12% between the date of the announcement and mid-November, while those of EDF Energy, E.ON, RWE and Iberdrola were relatively unaffected following the announcement.

Figure 5: Centrica and SSE returns against FTSE all-share index



Source: Bloomberg.

Figure 6: RWE, E.ON, EDF Energy and Iberdrola returns



Source: Bloomberg.

52. This evidence suggests that the beta information taken from Centrica and SSE is likely to provide the clearest insight into the systemic risks faced by an operator in GB. In addition, we observe that Centrica and SSE are the least geographically diversified of the Six Large Energy Firms and hence are also likely to be the closest comparables from the point of view of a stand-alone

GB business. We observe, however, that these firms have lower rather than higher betas than the more geographically diversified operators active in GB.

53. We next considered the extent to which the Six Large Energy Firms generated revenues and profits from activities with a significantly different (systemic) risk profile from that of generation and retail supply. In particular, we have sought to understand which firms derive significant revenue and profits from economically regulated (non-competitive) activities. Table 6 sets out a brief overview of the activities of the Six Large Energy Firms.

Table 6: Description of company activities

Company	*Description of activities*	*Importance of economically regulated activities*
Centrica	Active in E&P*, storage, generation and retail supply, as well as provision of home services across both the UK and North America	Centrica does not have significant exposure to regulated activities
EDF Energy	Active in generation and retail supply, as well as the transmission and distribution of power	EDF Energy has regulated transmission and distribution businesses in France and Hungary.†
E.ON	Active in E&P, generation and retail supply, as well as distribution networks	E.ON has regulated distribution businesses in a number of countries, including Germany, Sweden and Spain. These businesses have a total regulated asset base of c.€26bn and account for approximately 30% of total group EBITDA.‡
Iberdrola	Active in generation and retail supply, distribution networks and power generation, engineering and construction	C.25% of revenues and 100% of operating profits from regulated activities.
RWE	Active in lignite mining, power generation and retail supply, as well as distribution networks and commodity trading	More than one-third of RWE'soperating profits are currently derived from regulated activities.§
SSE	Active in E&P, generation, transmission and retail supply	Approximately half of operating profits from its network business.

Source: Centrica annual report 2013; SSE annual report 2014.
*Gas exploration and production, ie extraction of natural gas.
†EDF Energy electricity distribution.
‡E.ON charts. E.ON facts and figures.
§RWE presentation.

54. Iberdrola and SSE have a significant proportion of their activities (50% or more) in economically regulated sectors of the energy industry, while Centrica does not have (significant) exposure to these sectors. We observe that SSE's asset beta is significantly lower than the average for the Six Large Energy Firms but that of Iberdrola is around the average.

Views of the parties

55. RWE stated that there was strong empirical evidence to suggest that an adjustment (eg Blume) should be made when estimating beta values and noted that the CMA had previously made such adjustments, for example in the aggregates market investigation. It highlighted that, in this case, applying

a Blume adjustment would increase beta values.[33] Centrica also argued for the use of adjusted beta values, as well as weekly rather than quarterly estimates, highlighting that this approach would give an asset beta of 0.6 to 0.7 for either a vertically-integrated firm or a stand-alone generator.

56. In addition, RWE made a number of observations regarding the CMA's interpretation of the evidence on beta values. First, it stated that the beta values of SSE, Iberdrola, E.ON, EDF Energy and RWE would (all) be likely to be greater if they did not have their regulated industries, such that a stand-alone operator, ie one that was not operating in regulated markets, would likely have a higher beta. Furthermore, RWE put forward the argument that Centrica did not represent a hypothetical standalone operator in GB, noting that its financial performance was driven in part by its upstream gas operations with the result that the firm had the potential for much lower risk. Finally, RWE noted that the Six Large Energy Firms had a wide range of asset betas, reflecting the different risks associated with their business activities and underlying portfolios. Overall, RWE argued for a higher range of asset betas (than 0.5 to 0.6) to reflect these points.

57. Centrica argued that an appropriate asset beta for a stand-alone retail supplier is 1.0 to 1.2. It observed that our estimates of Just Energy's beta values supported this and argued that this firm was the most relevant comparator due to its relatively large size compared with the other independent retailers. In addition, Centrica emphasised that energy demand and gas demand (in particular) were extremely variable and volatile, with suppliers facing significant weather-related consumption risk that created volatility in annual profits.

58. SSE argued that the risk associated with energy retailing was greater than the average company of the FTSE index for three main reasons:

    (a) Energy retailers were exposed to the volumetric risk of customer churn with switching rates currently estimated to be around 13% per year.

    (b) Energy retailers faced risks associated with volatile input prices, uncertain volumes (due to weather risks) and the fact that retail prices could not be adjusted more frequently than once every four to six months to accommodate changes in cost pressures.

    (c) Some government scheme costs, such as ECO, had to be forecasted and priced into tariffs but the actual level of these costs was not known until after the period had ended, creating a risk that suppliers did not recover

[33] Competition Commission's aggregates market investigation.

the full costs. In addition, SSE noted that DECC often changed the rules around these schemes, resulting in uncertainty.

59. SSE put forward the view that traditional high street retailers and airlines could be considered alternative comparators for stand-alone energy suppliers, noting that the former faced similar competition risks but did not face input price risk, while airlines both had to hedge fuel input costs and faced volumetric risks associated with fixed costs of flying. SSE provided information on the betas of a range of high street retailers and airlines, which ranged from 0.69 to 1.10, with an average of 0.91. SSE suggested that the betas of high street retailers should provide a lower bound for the energy retailers whilst airlines may provide an upper bound.

CMA discussion of beta estimates

60. We first considered RWE's (and Centrica's) argument in respect of Blume adjustments. In the NIE price determination, we explained that we did not see the merits of such adjustments in the context of regulated utilities whose underlying risk profile may be expected to be stable and whose beta may be expected to be below 1. We note that while electricity generation and energy retail are not price regulated, they are utilities and we would expect their underlying risk profile to be relatively stable and beta values to be below 1.[34] We have not, therefore, made any adjustments to the raw beta values.

Generation beta estimates

61. Next, we consider the evidence on the asset betas of vertically-integrated and generation-only businesses. This indicates a range of between 0.25 and 0.75, with an average of around 0.5. While there is reasonable variation in the asset betas of individual firms, the direction of these variations is not always consistent with what theory may suggest. For example, Iberdrola has a significant network business and is internationally diversified but has an above average asset beta, while Centrica is largely UK-focused and does not have a network business but has a lower than average beta. Our review of the evidence in relation to beta values indicates that:

(a) firms with a significant focus on GB do not appear to have higher beta estimates than those firms which are more internationally diversified;

[34] This latter point is consistent with the evidence on beta values set out in Table 4. We note that in the Aggregates market investigation, we did not explicitly consider the appropriateness of Blume adjustments and came to a view on beta based on both raw and adjusted estimates.

(b) there do not appear to be systematic differences between the asset betas of firms that are vertically integrated and those that focus largely on generation; and

(c) there is little reliable evidence on the appropriate beta value for a stand-alone energy retailer.

62. We did not agree with RWE that the evidence supports higher beta values than those set out in Table 4 for the Six Large Energy Firms, since the estimates for firms such as Drax, which has neither regulated activities nor international operations, are towards the lower end of the range estimated. On this basis, we consider that the appropriate asset beta for a stand-alone, GB generation business is between 0.5 and 0.6. We observe that this is in line with the asset beta estimates provided by the Six Large Energy Firms (see Table and Table).

Energy retail supply beta estimates

63. Finally, we considered the appropriate asset beta for a stand-alone firm in energy retail supply. While we accept Centrica's and SSE's argument that there can be significant volatility in the profits of a retail supply business due to weather-related demand fluctuations, government scheme costs and input price changes, we note that these would only have an effect on beta to the extent that the volatility is correlated with overall market returns. Neither volumetric risk arising from fluctuations in the weather, nor changes in government scheme costs, exhibit this correlation.[35]

64. As highlighted in paragraph 24(c), the evidence collected on energy retailers' beta values is sufficiently inconsistent to limit the reliance that we can place on these estimates.[36] While we consider the evidence on Just Energy's beta to be relevant, we were concerned that this provided only one data point for our analysis. Therefore, we sought other evidence that could give us an indication of the likely asset beta of an energy retailer.

65. First, we considered the riskiness of energy supply relative to other sectors of the economy. We noted that demand for energy fluctuates from year-to-year in response to warmer/colder weather, with a relatively significant impact on the profits earned by energy firms. However, the occurrence of warm or cold winters is uncorrelated with the economic cycle. In general, we reasoned that demand for energy is likely to be less variable than overall demand in

[35] In relation to fluctuations in natural gas and/or power prices, we note that, to the extent that commodity prices fall during recessions due to declining demand, this should reduce the input costs of energy retailers and increase their profits.
[36] This inconsistency is both across firms and between monthly and quarterly beta estimates for the same firm.

response to the economic cycle as energy is a basic necessity for domestic customers. However, we recognised that business demand may be somewhat more variable due to greater rates of business failure during a recession. The next issue that we considered was how a fall in demand for energy would impact the profitability of an energy retailer. The main influence in this respect is the level of operational gearing of a firm, ie the extent to which costs reduce when revenue falls. If costs are largely fixed, a relatively small fall in demand will have a large impact on profits, whereas if costs are largely variable, a decline in demand should be largely offset by a decline in costs. We observed that energy retailers had relatively low operational gearing, with a large proportion of costs varying with volumes of sales. This suggests that energy retailers should have an equity beta of less than 1 (which corresponds to an asset beta of less than 0.8).

66. Next, we observed that energy retailers were likely to experience greater volatility in returns than regulated utilities, as they were exposed to certain cyclical factors, such as losses resulting from falling demand, to a greater extent than such firms. This indicates that energy retailers should have an asset beta above the 0.35 to 0.40 level used in the NIE price redetermination.

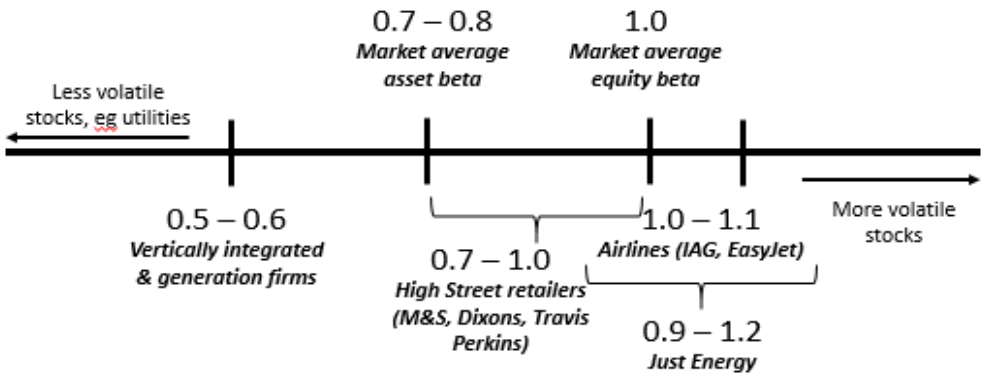
67. We next considered the extent to which betas observed in other sectors could be considered to provide insight on the likely beta of an energy retailer. We took into account both those potential sectors and firms put forward by SSE as well as the groceries sector. SSE's proposed comparators comprised IAG, EasyJet, Next, Kingfisher, Marks and Spencer, Travis Perkins and Dixons Carphone. We observed that both high street retailers and airlines could be expected to experience greater volatility in demand in response to the economic cycle than energy retailers (particularly the domestic segment) due to the more discretionary nature of these products, particularly air travel. In addition, we observed that these comparators tended to have higher operational gearing (greater proportion of fixed costs) than an energy retailer due to their store portfolios/aircraft leasing commitments.[37] The evidence provided by SSE indicated that these firms had (asset) betas of between 0.69 and 1.10, with an average of around 0.91. We considered that this evidence was consistent with an energy retailer having an asset beta of around 0.7, ie towards the lower end of this range. Figure 7 shows the beta values of various industries.

68. Finally, we observed that the groceries sector could be thought of as having a similar demand risk profile as domestic energy customers in response to

[37] We observed that the large majority of energy retailers' costs are variable rather than fixed. A firm with higher operational gearing will experience a greater percentage decline in profits in response to a given percentage decline in revenues than a firm with lower operational gearing would.

changes in economic conditions. A proportion of their product offering may be regarded as non-discretionary, and hence their exposure to economic conditions is limited to some extent. We observed that Tesco, Sainsbury's and Morrisons have asset betas of 0.55, 0.63 and 0.25 (respectively), which indicates that energy retail suppliers may also have asset betas of around 0.55 to 0.65.[38] However, we reasoned that demand for energy from SME and I&C customers was likely to be more highly correlated with the economic cycle than domestic demand as the rate of firm failure increases in recessions, with a resulting impact on the profitability of energy suppliers. On this basis, we came to the view that the returns of grocers may be less correlated with the wider market than those of energy retailers due to the latter's exposure to business customers.

Figure 7: Beta values of comparable industries



Source: CMA analysis.

69. While there is a reasonable level of uncertainty over the appropriate beta value for an energy retail firm, we consider that the combination of evidence we have collected and theory indicates that it is likely to be around the market average of 1 (equity beta) or 0.7 to 0.8 (asset beta).[39]

Gearing

70. We examined the levels of gearing of both the Six Large Energy Firms active in GB and a number of European and non-European comparable companies.

[38] These asset betas are calculated over the most recent five years, on a monthly basis.
[39] With a beta of 1 (by definition) and average gearing among firms of approximately 30%, UK equities generally can be thought of as having an asset beta of around 0.7.

The results of this analysis, as set out in Table 7, show that there is significant variation both within firms across time and across energy firms.

Table 7: Gearing levels of energy firms

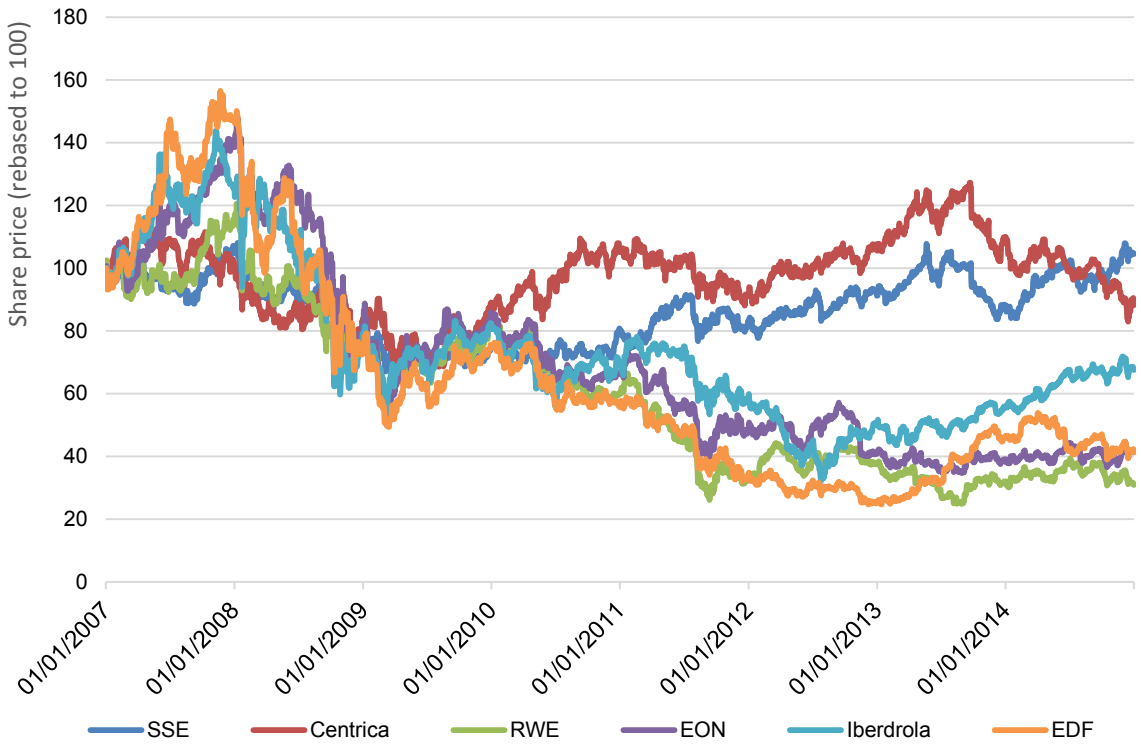
%

Company	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*Average*
Six Large Energy Firms									
Centrica plc	13.9	6.3	4.3	19.0	17.2	19.5	20.2	22.9	*15.4*
SSE plc	18.2	14.3	23.1	33.3	36.1	30.3	32.5	27.9	*27.0*
EDF SA	24.9	9.3	25.0	37.8	39.7	51.5	64.5	45.1	*37.2*
E.ON SE	13.2	18.2	42.0	38.9	39.5	45.8	46.9	43.2	*36.0*
Iberdrola SA	31.0	30.8	49.0	44.1	45.6	49.2	51.5	48.6	*43.7*
RWE AG	1.0	2.2	14.5	28.9	37.8	52.0	49.9	50.3	*29.6*
Average	***17.0***	***13.5***	***26.3***	***33.7***	***36.0***	***41.4***	***44.2***	***39.7***	
VI firms (non-UK)									
Enel S.p.A.	22.0	57.4	69.3	67.1	68.6	71.5	71.2	69.9	*62.1*
Gas Natural Fenosa	19.5	19.1	37.2	60.2	64.0	56.7	54.3	45.8	*44.6*
EnBW AG	23.9	16.3	21.0	38.2	36.1	35.2	36.2	34.4	*30.2*
Verbund AG	14.6	14.6	23.5	32.8	31.0	38.5	42.6	45.7	*30.4*
Fortum Oyj	19.4	14.8	32.9	27.6	26.9	34.1	40.1	36.5	*29.0*
Contact Energy Limited	13.3	9.3	12.9	23.6	27.1	21.8	27.3	25.6	*20.1*
TrustPower Limited	14.3	15.1	18.5	24.1	24.1	26.0	25.1	27.4	*21.8*
NRG Energy Inc	57.1	44.9	58.7	52.1	61.8	69.0	66.3	62.8	*59.1*
Origin Energy	0.0	24.8	24.3	7.6	6.0	5.8	23.7	26.1	*14.8*
AGL Co	36.5	31.7	23.6	6.4	22.6	24.1	34.1	37.5	*27.1*
Generation firms									
GDF Suez	10.3	26.5	32.0	36.2	43.1	55.7	61.1	47.8	*39.1*
Drax plc	9.7	14.1	11.0	3.5	0.0	0.0	0.0	0.0	*4.8*
AES Corp	53.6	55.5	77.5	69.6	65.9	71.6	72.6	67.9	*66.8*
AEP Corp	43.6	43.6	56.1	50.3	50.3	46.9	46.7	45.0	*47.8*
Calpine Corp			73.8	63.5	60.2	54.0	53.5	55.0	*60.0*
UK retail only firms									
Good Energy Group plc							0.0	18.0	*9.0*
Telecom Plus plc	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	*0.5*
Just Energy	0.7	1.5	2.7	1.5	12.1	19.3	27.4	49.2	*14.3*

Source: Bloomberg data, CMA analysis.

71. We observe that across the industry there was a general trend of increasing leverage between 2007 and 2012, with a slight decline in 2013. This was caused, at least in part, by the financial crisis and declines in the equity value (and therefore market capitalisation) of these firms. Figure 7 shows the share prices of the Six Large Energy Firms over the period (rebased to 100). RWE, E.ON, Iberdrola and EDF Energy have all experienced significant declines in their equity value over the period, falling by 50% or more for each from the value as of mid-2007. The share prices of Centrica and SSE, in contrast, have performed better, ending the period at a similar level to that at the beginning of the period. As a result, we consider that the gearing of these firms is likely to be closest to a long-run sustainable level for a vertically integrated energy firm.

Figure 8: Share prices of the Six Large Energy Firms (rebased), 2007 to 2014



Source: Bloomberg data, CMA analysis.

72. We have also taken into account the views of the Six Large Energy Firms regarding the long-term sustainable level of gearing as set out in their cost of capital estimates (see Table and Table). These range from 25 to 50%. For example, Centrica noted that its [✂].Centrica also put forward the argument that the gearing level of SSE was increased to a significant extent by its regulated activities, highlighting that the notional gearing of its around £7 billion regulated asset base was between 55 and 65% under the RIIO price controls. Centrica suggested that the gearing ratio of the competitive component of SSE's business would be significantly lower than (the overall average of) 28%. On this basis, Centrica proposed a gearing ratio of between 10 and 30%.

CMA discussion

73. We noted that in 2006 and 2007, prior to the large declines in share prices, the (unweighted) average level of gearing for the Six Large Energy Firms was below 20%, increasing over the period to a peak of 44% in 2012. The gearing levels of Centrica and SSE over the period as a whole were lower, in some cases significantly so, than for the other Large Energy Firms. We agreed with Centrica's argument that the overall gearing level of SSE was likely to have been increased by its regulated activities and therefore may have been higher than would be optimal for a vertically integrated energy firm without such

operations. We concluded, therefore, that Centrica's proposed range of between 10 and 30% gearing was likely to be sustainable for a vertically integrated firm. We next considered how this might differ for a stand-alone generation business. The evidence in Table 7Table 7 is mixed, with Drax having a gearing level at the lower end of this range and some of the other operators having significantly greater gearing. On this basis, we reasoned that a stand-alone generator would be able to support a similar level of gearing to a vertically-integrated firm, ie between 10 and 30%.

74. Several parties have told us that a stand-alone retail supplier would not be able to carry any debt on its balance sheet. Centrica stated that a stand-alone retail business the size of British Gas would not be able to raise debt finance owing to its higher level of business risk. Similarly, [✂].On this basis, our current view is that a stand-alone retail supplier would not be able to support any material level of gearing and therefore we have estimated the WACC of a stand-alone supplier on the basis that it is entirely funded by equity.

Cost of debt

75. In order to come to a view on the likely cost of debt of a GB energy firm, we have examined a range of evidence, including:

(a) yields and spreads on sterling-denominated corporate bonds issued by the Six Large Energy Firms with a maturity of between 10 and 30 years;

(b) spreads on UK corporate bonds of various credit ratings over the relevant period; and

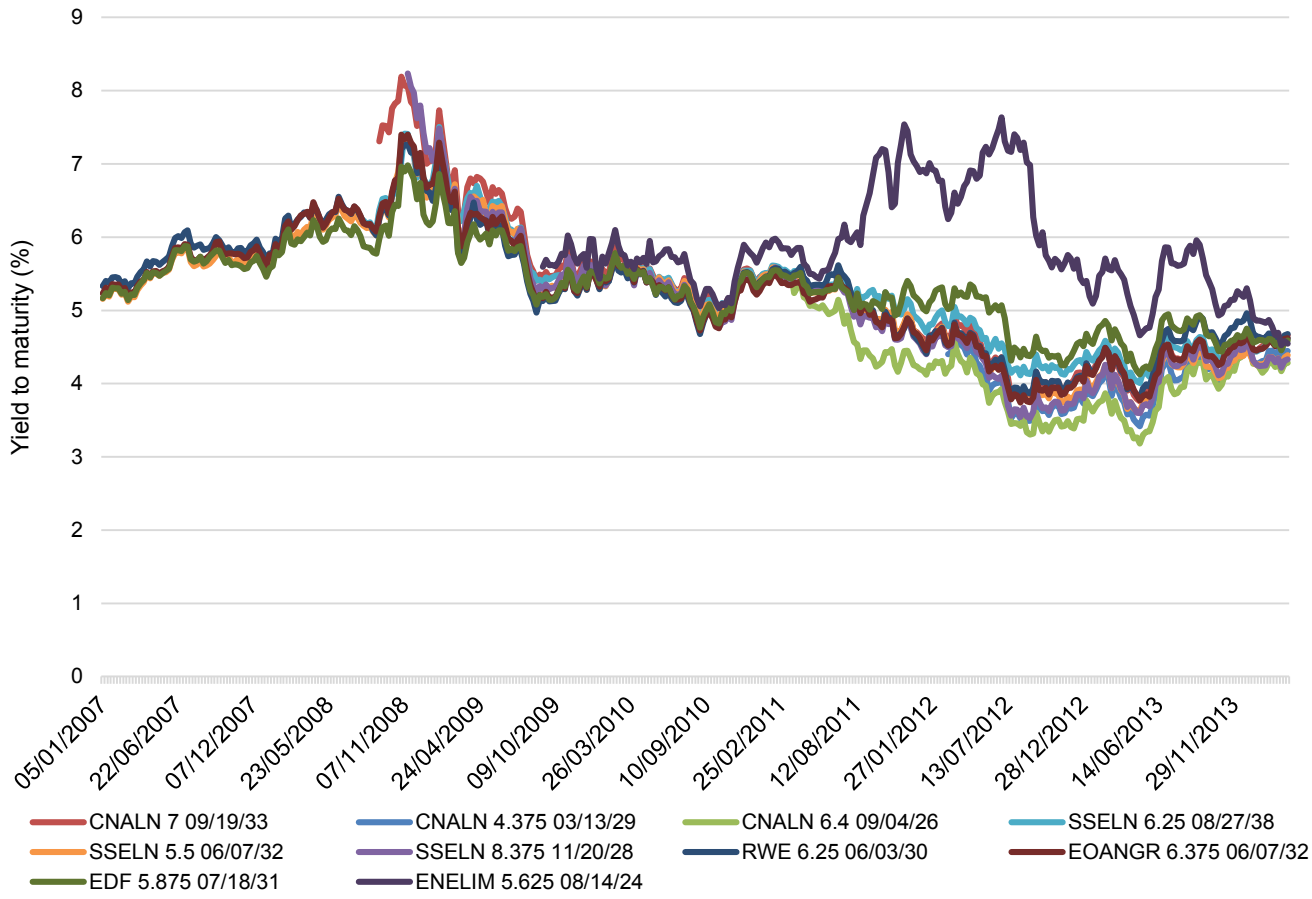
(c) the credit ratings of the Six Large Energy Firms, as compared with those of smaller, less diversified operators.

76. Figure 8 shows the yields on the sterling-denominated corporate bonds of a number of large, vertically integrated European energy firms (Centrica, SSE, RWE, E.ON, EDF Energy and the Italian-based electricity company, Enel). We have examined returns on corporate bonds with relatively long-dated maturities in order to make them comparable with the gilt yields examined in paragraphs 19 to 22, ie maturities of between 10 and 30 years over the period as a whole. Yields have fluctuated over the period, increasing during the financial crisis to between 7 and 8% before falling back to pre-crisis levels between 2009 and 2011. In 2012 and 2013, yields fell further to between 3.5 and 5%. We note that the yields on Enel's bonds rose above those of its competitors between 2011 and 2013. Given the pattern of yields on other companies' bonds, we consider this to be indicative of company-specific

factors and we have, therefore, discounted Enel's yields in reaching a view on the relevant cost of debt.

77. For the period as a whole, we consider that this evidence suggests a cost of debt of between 5 and 6% for companies with an investment-grade credit rating. This is equivalent to a spread of between 100 and 200 basis points over nominal gilt yields.

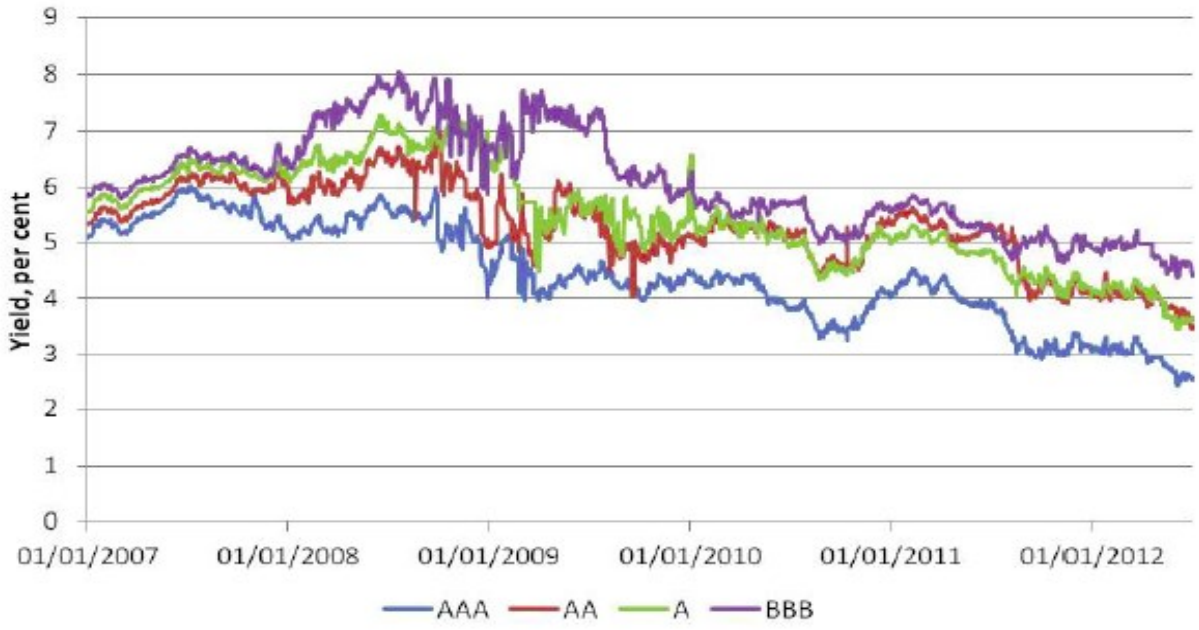
Figure 9: Energy firm corporate bond yields, 2007 to 2014



Source: Bloomberg data, CMA analysis.

78. Figure 9 shows the redemption yields on UK corporate bonds of differing credit ratings for the majority of the period under review. Between 2007 and 2012, yields on A-rated bonds averaged just over 5%, while those on BBB-rated bonds fluctuated between 4.4 and 8%, with an average of approximately 6.1%. These figures are consistent with the yields on energy company bonds.

Figure 10: UK corporate bond redemption yields, 2007 to 2012



Source: Thompson Reuters, based on ten-year corporate bonds.

79. We next considered the credit ratings of the Six Large Energy Firms and the extent to which these might be different for a stand-alone GB operator and for a generation-only business.[40] Table 8 shows the credit ratings of the Six Large Energy Firms, as well as some other energy businesses (as of December 2014). All these firms have investment-grade credit ratings apart from Drax and AES Corp, which have BB-ratings.

Table 8: Credit ratings of European energy firms

Company	*Moody's*	*Standard & Poor's*	*Fitch*
Centrica plc	A3	A-	A-
SSE plc	A3	A-	A-
EDF SA	Aa3	A+	A+
E.ON SE	A3	A-	A-
RWE AG	Baa1	BBB+	BBB+
Iberdrola SA	Baa1	BBB	BBB+
GDF Suez	A1	A	-
Enel S.p.A.	Baa2	BBB	BBB+
Drax		BB	-
AES Corp*	-	-	BB-

Source: Bloomberg.
*Business Wire, 'Fitch affirms AES' ratings'.

80. We consider that a vertically integrated energy firm with operations only in GB would achieve a similar credit rating to an internationally diversified business and therefore would incur a cost of debt of between 5 and 6%.

[40] As set out in paragraph 74, in our analysis of the WACC of electricity and gas retail suppliers, we are assuming that they are entirely financed by equity. Therefore, we do not consider further the credit rating that they would achieve.

81. The evidence on Drax indicates that a stand-alone generator in GB would probably achieve a credit rating of BB (ie just below investment grade). While there is limited information available on the yields on BB-rated corporate bonds, Drax told us that as at the end of 2014, it had £325 million of long term borrowing, with a weighted average interest cost of 4.21%. Drax highlighted that this rate of interest was lower than the cost of debt produced by the Drax WACC model [✂] because the model assumes a higher normalised long term risk free rate equal to 4.5%. E.ON suggested that a pre-tax cost of debt of around 6% would be appropriate for a stand-alone generation business, on the [✂] basis of [✂] listed debt securities, which it observed had (as of September 2014) a yield to maturity of [✂]% on ten-year bonds. In contrast, RWE argued that the additional premium required on BB-rated bonds (compared with BBB-rated bond) would be around 200 basis points, which it estimated based on US data on spreads (as UK data was not available). This gives a cost of debt of between 7 and 8%. Centrica highlighted that the average A-BB spread was 2.39% (for USD bonds) and 3.72% for EUR bonds and, on this basis, suggested the CMA use a higher cost of debt range of 6.0 to 7.5%. We noted the arguments put forward by RWE and Centrica but we reasoned that the most reliable evidence on the likely debt costs for a stand-alone GB operator were the actual debt costs incurred by Drax. We noted Drax's point about its current interest costs being below a longer-run average [✂]. On this basis, we have used a range of between 6 and 7% for a stand-alone operator, which is equivalent to a premium of 100 basis points over the cost of debt for a business with an investment-grade credit-rating.

Interpretation of WACC

82. Our estimate of the WACC provides a benchmark against which to assess the profitability of the industry. Several parties have raised issues of interpretation of the WACC. In this section, we provide a summary of these points together with our current view on them.

Fair bet principle

83. RWE noted that while the cost of capital only takes into account the market risk faced by an investor, when performing an investment appraisal, the specific risks of a project are reflected in the cash flow forecasts used. For example, a project may have a 50% probability of success and a 50% probability of failure, with expected returns an average of these two outcomes. A comparison of the ex-ante cost of capital with the ex post returns made on a given project may give a misleading view of profitability. The observed returns may reflect a successful project whereas ex ante there was a reasonable risk

that the project would be unsuccessful such that the expected returns did not exceed the cost of capital.

84. We agree in principle with the argument put forward by RWE. However, we consider that this principle is more relevant to the appraisal of the profitability of a single project, such as the construction and operation of a single power station, than the appraisal of the profitability of an industry as a whole, which is the exercise that we are undertaking. The latter depends on a large number of projects with differing risk profiles undertaken by a number of firms over many years. As RWE states, '[i]f this project were repeated many times, then on average we would expect the weighted outcome'. Our current view is that it is reasonable to expect approximately the weighted outcome in this case.

Political and regulatory risk

85. E.ON, Centrica and OVO put forward the view that there was an increase in political and regulatory risk over the period. E.ON suggested that this will have increased the return that both equity and debt investors required for bearing these and other risks. Centrica put forward the view that political and regulatory risk was in fact a systematic risk since such interventions were correlated with movements in wholesale energy prices, which could be expected, in turn, to be correlated with wider movements in market returns because of the importance of energy in the wider economy. In particular, Centrica highlighted that announcements by the Labour Party had focused on limiting retail tariff increases when wholesale prices rose and forcing tariff reductions when wholesale costs fell. Centrica gave the example of a price cap, noting that a firm that operated under such regulation had more volatile returns than one that did not since the price cap limited the ability of the firm to vary prices in response to changes in input costs.

86. The theory underlying the CAPM is that when determining the level of return they require, investors should only take into account the systematic or non-diversifiable risk associated with a firm. This is captured by the firm's beta value and, at least in theory, does not need to be adjusted for in any other respect. As discussed in paragraphs 83 and 84, the specific risks associated with a project should be reflected in the cash flow forecasts. If political and regulatory risks were to increase over time, we would expect firms to take this into account in their sensitivity analyses before undertaking investments. Our current view is that this would not affect the underlying cost of capital.

87. We considered Centrica's argument regarding the systemic nature of political and regulatory risk. We observed that the example given of the Labour Party's announcements appeared to indicate that political intervention was a risk for the industry whether wholesale energy prices were rising or falling. Finally, we

noted that although a price cap has been discussed by the Labour party, no such regulation was in place over the 2007 to 2013 period of review and therefore, we did not agree that it was appropriate to make any adjustments to reflect any increased volatility from such an intervention.

Impact of generation technology

88. EDF Energy put forward the view that the risk of operating a nuclear plant was higher than that of other plant types. It highlighted that:

    (a) nuclear returns were significantly less sensitive to fuel input costs than gas and coal plant due to a substantially higher fixed cost base; therefore, nuclear returns were fully exposed to market power prices;

    (b) nuclear plants had higher start-up and shut-down costs than gas and coal plants and could not easily vary their output in response to changes in demand and supply; and

    (c) nuclear plant faced stricter regulatory requirements and security arrangements. In particular nuclear was highly sensitive to plant failure: one plant experiencing an issue could result in sister stations (or wider) being shut down for investigation of whether that issue might also affect them.

89. We considered the impact that the type of generation plant might have on the return that an investor would require. We noted that the CAPM indicates that investors will only seek a higher return for risks that are systematic, ie correlated with movements in the overall market, rather than those that can be diversified away by holding a portfolio of investments. As regards EDF Energy's first argument on nuclear plants' exposure to market power prices, we observed that while returns would clearly be affected by movements in market power prices, these movements were not correlated with the broader economic cycle. In addition, we reasoned that while the returns on nuclear plants would be affected by lower prices, their lower marginal costs (compared with gas and coal plant) and resulting position in the merit order as base load, would reduce the volatility of their returns in response to market power prices as compared with thermal generation technologies. Nuclear power plants are always dispatched, enabling them to earn a margin throughout the year and avoiding the costs of starting up and shutting down. Finally, we reasoned that the probability of a plant failure, however many plants were affected, was not correlated with movements in market returns and hence should not be reflected in a higher cost of capital. We did not consider it appropriate, therefore, to apply a different beta value to nuclear generation compared with thermal generation.

Size and value premia

90. E.ON observed that there are examples of divergences between returns on small and large capitalisation stocks, as well as between returns on 'value' and 'glamour' stocks, such that the CMA may wish to consider including such size and value premia in arriving at appropriate WACC values. It noted that a stand-alone generator or retail supplier may be a 'small' stock where the integrated firm (combination of the generation and supply business) may not. Similarly, RWE stated that an additional risk premium may be appropriate when considering the WACC of a stand-alone generation business.

91. While we recognise that there may be some examples of divergences between the returns on 'small' and 'large' stocks and on 'value' and 'glamour' stocks, our initial review of the literature indicates that Fama-French models generally fail to describe reliably the cross-section of returns in the UK.[41] Moreover, even if there were such evidence in relation to the UK market, we consider that it would not necessarily be right to infer from this that the typical stand-alone energy business (whether vertically integrated, or operating either in generation or in retail supply) would require a size premium. In the first instance, we note that the majority of the energy firms active in GB are generally very large businesses. Second, it is not clear that these businesses would necessarily share any (unknown) general characteristics of small firms that increase their cost of capital due to higher risk. Our current view, therefore, is that it is not appropriate to reflect a size or value premium. This is in line with previous CMA (and Competition Commission) decisions in both market investigations and price determinations, such as private healthcare and Bristol Water.

[41] See A Gregory, R Tharyan and A Christidis (2011) *Constructing and testing alternative versions of the Fama-French and Carhart models in the UK*, University of Exeter, and S. Mouselli, M. Michou and A. Stark (2008) *On the information content of the Fama and French factors in the UK*, University of Manchester.

Annex A: Firms' submissions on their cost of capital

1. In this appendix, we set out the views of both the Six Large Energy Firms and the mid-tier generators and suppliers on their cost of capital. Table 1 shows the cost of capital estimates of four of the Six Large Energy Firms for their operations as a whole. We note that these may include activities that are outside the scope of our investigation, such as overseas generation and retail activities or UK-based exploration and production, gas storage or other activities.

Table 1: WACC estimates for vertically integrated or whole-group operations

	*Centrica**	*EON*†	*RWE* ‡	*SSE*§
Real RFR (%)	[✂]	[✂]	[✂]	[✂]
Nominal RFR (%)	[✂]	[✂]	[✂]	[✂]
ERP (%)	[✂]	[✂]	[✂]	[✂]
Asset beta	[✂]	[✂]	[✂]	[✂]
Equity beta	[✂]	[✂]	[✂]	[✂]
Post-tax Ke (%)	[✂]	[✂]	[✂]	[✂]
Pre-tax Ke (%)	[✂]	[✂]	[✂]	[✂]
Pre-tax cost of debt (Kd) (%)	[✂]	[✂]	[✂]	[✂]
Gearing (%)	[✂]	[✂]	[✂]	[✂]
Tax rate (%)	[✂]	[✂]	[✂]	[✂]
Pre-tax WACC	[✂]	[✂]	[✂]	[✂]
Post-tax WACC (%)	[✂]	[✂]	[✂]	[✂]

Source*:* Centrica, E.ON, RWE and SSE submissions to the CMA.
*The information for Centrica has been taken from its response to GQ40, pages 100 to 102, [✂].
†E.ON provided this information on its overall group cost of capital for 2012 and 2013 in its response to GQ34.
‡ The WACC for RWE is that for the group as a whole and has been taken from RWE 2013 *Annual report* (p69).
§[✂].
¶ [✂].

2. EDF Energy did not provide a view of its group WACC or the WACC of its generation business in its responses to the generation and supply questionnaires.[42] In its response to the generation questionnaire, SSE suggested that the appropriate nominal pre-tax WACC for the SSE group as a whole was [✂].

3. Scottish Power provided a range of evidence collected from broker reports, some of which estimated the WACC of the business as a whole and some of which focused on the generation activities. This evidence is set out in Table 2 and on average indicates a nominal, pre-tax WACC of 9.5%.

[42] EDF did provide this information for EDF Trading.

Table 2: Scottish Power's submission on its WACC, based on broker reports

Broker	*Report date*	*Report ref*	*Business*	*WACC (post-tax nominal) (%)*	*WACC (pre-tax nominal (%)*
Santander	11-May-12	Page 3	UK Liberalised	6.8	9.3
Bank of America Merrill Lynch	01-Jun-12	Page 17	SP Supply and Generation	8.0	10.9
Societe Generale	30-Jul-12	Page 17	SP Wholesale	8.0	10.9
Credit Suisse	01-Aug-12	Page 29	UK Power Generation	7.5	10.2
Citi	29-Oct-13	Page 12	UK Power Generation	5.8	7.7
Bankia	30-Oct-13	Page 2	UK Liberalised	7.0	9.3
N + 1 Equities	29-May-14	Page 6	UP Power Generation	6.6	8.6
			Mean	*7.1*	**9.5**

Source*:* Scottish Power.

4. Some of the Six Large Energy Firms highlighted that their group WACC estimates did not provide appropriate benchmarks for the CMA's profitability analysis for a number of reasons. In particular, they emphasised that a stand-alone generation or supply business would face a different WACC, as would a vertically integrated firm that was not diversified internationally.[43] Therefore, we next set out the firms' estimates of the appropriate WACC for their stand-alone generation and supply businesses.

5. In contrast, Scottish Power told us that the evidence it collected from broker reports and independent advice it received from Oxera did not show that a substantial difference existed between the WACC for Scottish Power's generation businesses and its combined unregulated business activities. It stated that:

> [w]hen combined with the uncertainty in estimating the WACC more generally, Oxera recommends that the plausible range for the WACC of our whole value chain is broadly similar to the range Oxera estimated for Generation … Similarly, there is no robust market evidence to conclude that were Scottish Power to operate on a stand-alone basis, our WACC would be materially different to the estimates provided. (As explained [elsewhere], there are likely to be differences in risk capital requirements between VI [vertically integrated] and non-VI businesses).

Generation WACC

6. Centrica provided estimates of its (post-tax) WACC for its generation activities separate from its other operations. It noted that it considers the post-tax WACC of its generation business as a whole to be 7%, with this WACC being

[43] Per E.ON SE *Annual report* 2013. For example, E.ON noted that the cost of debt that formed the basis of E.ON SE group's cost of debt is heavily influenced by historically low yields on German bunds and therefore does not represent an achievable cost of debt in the GB financing marketplace.

applicable for both thermal and wind generation assets. It estimated that an appropriate WACC for a stand-alone nuclear business would be slightly higher at 8% (post-tax). However, Centrica explained that these estimates are based on specific beta values[44] and standard UK tax rates (20%) but with all other elements of the WACC calculation being based on group-level figures, ie for the cost of debt and gearing. It noted that a stand-alone generation business would be likely to have a lower credit rating, a higher cost of debt and/or different gearing levels when compared with a vertically integrated firm. As a result, the estimates provided for the various generation activities may not accurately reflect the WACC of a fully stand-alone power generation entity.

7. E.ON put forward the view that the appropriate pre-tax nominal WACC for either a stand-alone GB generation business (excluding GB trading) would be approximately [✂]% on the basis of:

   (a) a nominal RFR of between 4.5 and 5% (a real RFR of 1 to 1.5% and RPI inflation of 3.5% over the relevant period);

   (b) a country risk surcharge of [✂]% to be added to the ERP to reflect the impact of greater political and regulatory risk in the UK;

   (c) an asset beta of [✂], which E.ON states is in line with the asset beta of [✂] over the relevant period; and

   (d) a cost of debt of around [✂]%, based on the reference point of AES Corporation's listed debt securities which had (as of September 2014) a yield to maturity of [✂]% on 10-year bonds.

8. RWE provided an estimate of the WACC of its generation business as separate from its other operations as shown in Table 3. However, the calculation of this WACC included two assumptions that RWE considered might not be appropriate for a stand-alone generation business. First, the beta value was based on those of a range of comparable companies, several of which were not stand-alone generation businesses. Second, RWE highlighted that a stand-alone firm may have to pay an additional premium on its debt over that of RWE's generation business. In effect, a higher beta value and a higher cost of debt could result in a larger WACC.

9. SSE submitted a report carried out by Frontier Economics (Frontier) that sought to identify an appropriate WACC for a stand-alone generation business based on industry benchmarks. Frontier sought to exclude evidence

[44] [✂].

which was derived from vertically integrated and/or regulated businesses because it considered that the WACCs of these would not necessarily be appropriate. It also focused on businesses with thermal generation rather than nuclear or renewable technologies, with the latter viewed as being more risky. Frontier proposed a range of nominal pre-tax WACC of between 9.8 and 14.3%, although it did not provide a breakdown of the various components of the estimate, ie RFR, ERP etc. We observe that this range is broadly in line with the estimates provided by the other firms for their generation businesses.

Table 3: WACC estimates for generation businesses

	EON	*RWE*	*Scottish Power*
Real RFR (%)	[✂]	[✂]	[✂]
Nominal RFR (%)	[✂]	[✂]	[✂]
ERP (%)	[✂]	[✂]	[✂]
Asset beta	[✂]	[✂]	[✂]
Equity beta	[✂]	[✂]	[✂]
Post-tax Ke (%)	[✂]	[✂]	[✂]
Pre-tax Ke (%)	[✂]	[✂]	[✂]
Pre-tax cost of debt (Kd) (%)	[✂]	[✂]	[✂]
Gearing (%)	[✂]	[✂]	[✂]
Tax rate (%)	[✂]	[✂]	[✂]
Pre-tax WACC	[✂]	[✂]	[✂]
Post-tax WACC (%)	[✂]	[✂]	[✂]

Source*:* E.ON, RWE npower and Scottish Power submissions to the CMA.
¶Note: Oxera has used a slightly different formula to convert asset betas into equity betas. On the assumption that this approach has been consistently applied, the equity betas quoted indicate a range of asset betas of between 0.55 and 0.66 on a comparable basis with the other asset betas set out in this table (and the tables above).

Supply WACC

10. While Centrica questioned the feasibility of a stand-alone supply business of the scale of British Gas it estimated that a (hypothetical) appropriate cost of capital for a stand-alone supply business would be between 11 and 15% based on:

    (a) a combined nominal RFR and ERP giving an implied required market return of between 10 and (just over) 11%;

    (b) an equity beta of between 0.9 and 1.2 (although in the absence of debt, this range would be reduced); and

    (c) where it was possible for some debt to be raised, a debt premium of between 5 and 6% (over the RFR) would be required.

11. E.ON put forward the view that the appropriate pre-tax nominal WACC for a stand-alone GB supply business would be approximately [✂]% on the basis of:

    (a) a nominal risk-free rate of between 4.5 and 5% (a real risk-free rate of 1 to 1.5% and RPI inflation of 3.5% over the relevant period);

(b) a country risk surcharge of [✂]% to be added to the ERP to reflect the impact of greater political and regulatory risk in the UK;

(c) an asset beta of 0.7, which E.ON stated was in line with the asset beta of [✂] of a selection of retailers, over the relevant period; and

(d) a cost of debt before taxes of approximately [✂]% and gearing of [✂]%, taking as a reference point the margins on debt observed for a selection of retailers.

12. RWE estimated a pre-tax WACC of [✂] for a supply business based on:

(a) an RFR of 3.78%, estimated using the interest rate yield curve published by the Bundesbank;

(b) an ERP of 5% based on a KPMG study and a recent Ofgem decision;

(c) a beta of 0.87 based on a number of comparator companies;

(d) a cost of debt of 5.08% on a pre-tax basis and 3.69% on a post-tax basis (therefore assuming a tax shield of 27.38%); and

(e) gearing of [✂], which is guided by the RWE target credit rating and also takes into account typical financing structures given the owned asset classes and sector norms.

13. SSE did not provide a WACC estimate for a supply business but did suggest that the most natural comparators for energy retailers included supermarkets, high street retailers and airline operators because these businesses tend to be asset light in nature and face similar levels of risk to energy retailers. However, SSE observed that energy retailers may not be able to change retail prices in response to rising costs as rapidly as high street retailers such that they may be exposed to additional risk.

Annex B: Corporate tax rates

Corporate tax rates

Country	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*Average*
UK	30.00	30.00	28.00	28.00	26.00	24.00	23.00	27.00
France	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33
Germany	38.36	29.51	29.44	29.41	29.37	29.48	29.55	30.70
Australia	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Hong Kong	17.50	16.50	16.50	16.50	16.50	16.50	16.50	16.60
Spain	32.50	30.00	30.00	30.00	30.00	30.00	30.00	30.40
Italy	37.25	31.40	31.40	31.40	31.40	31.40	31.40	32.20
Austria	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Greece	25.00	25.00	25.00	24.00	20.00	20.00	26.00	23.60
Canada	36.10	33.50	33.00	31.00	28.00	26.00	26.00	30.50
Finland	26.00	26.00	26.00	26.00	26.00	24.50	24.50	25.60
US	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
NZ	33.00	30.00	30.00	30.00	28.00	28.00	28.00	29.60

Source: KPMG global tax rates.

Annex C: Beta estimates

1. Table 1 shows which stock market index has been used to calculate the beta values for each of the comparable firms. In each case, we have chosen the main index for the stock exchange in the country in which the firm has its headquarters.

Table 1: Stock market indices used to calculate beta values

Company	*Stock market index*
Six Large Energy Firms	
Centrica plc	FTSE 100
SSE plc	FTSE 100
EDF SA	CAC 40
E.ON SE	DAX 30
Iberdrola SA†	IBEX 35
RWE AG	DAX 30
VI firms (non-GB)	
Enel S.p.A.	FTSE MIB
Gas Natural SA	IBEX 35
EnBW AG	DAX 30
Verbund AG	ATX
Fortum Oyj	OMXH 25
Contact Energy Limited	NZSE 50
TrustPower Limited	NZSE 50
NRG Energy Inc	S&P 500
Origin Energy	S&P/Asx 200
AGL (Australian Gas Light Co)	S&P/Asx 200
Generation firms	
GDF Suez	CAC 40
Drax plc	FTSE 100
AES Corp	S&P 500
American Electric Power Corp	S&P 500
Calpine Corp	S&P 500
Energy retailers	
Telecom Plus plc	FTSE 100
Good Energy	FTSE 100
Just Energy	S&P 500
Crius Energy Trust	S&P 500

Source: CMA analysis.