Reckon LLP
Data analysis | Economic regulation | Competition law

Second opinion on draft WACC decision for electricity distribution

Prepared by Reckon LLP
for Energiekamer
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1. This report provides:

   (a) A second opinion on the approach adopted by Energiekamer to determine the WACC for electricity distribution networks.

   (b) A review of stakeholder comments on Energiekamer's draft decision, based on information provided by Energiekamer.

2. Energiekamer's approach to the WACC drew on two papers by Oxera: a methodology paper related to inflation and gearing,[1] and a quantitative analysis paper.[2]

Inflation

Why it is necessary to adjust the WACC for inflation

3. Most of the data used to estimate the cost of capital in the Netherlands are in nominal terms, in euros.

4. The price control regime used by Energiekamer is based on a regulatory asset value that is indexed by inflation.

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[1] Oxera (2010), Updating the WACC for Energy Networks: Methodology paper, February, published by Energiekamer, http://go.reckon.co.uk/b36484 (PDF).
[2] Oxera (2010), Updating the WACC for Energy Networks: Quantitative Analysis, February, published by Energiekamer, http://go.reckon.co.uk/b26313 (PDF).

5. Provided that the allowed return on capital is such that the enterprise value remains broadly in line with the regulatory asset value, then in addition to the gains associated with the allowed return on capital, investors receive a further return on their capital in the form of capital growth in line with inflation.

6. The determination of the WACC to be included in the price control calculations needs to take account of the inflation element of returns in order to avoid double counting.

7. We call "WACC net of inflation" the WACC adjusted to avoid double counting of inflation.

8. A further effect of using a WACC net of inflation is to link revenues to fluctuations in the CPI. This provides investors with a degree of protection against macroeconomic fluctuations insofar as the CPI is correlated with the costs of finance. This effect occurs irrespective of how the WACC has been adjusted for inflation in setting the price control.

Oxera's stated principles for the choice of data sources for inflation

9. Oxera's report sets out principles for the choice of data sources for inflation under the heading "2.4 Conclusion". We think that these are sufficiently justified by the information presented.

10. Oxera gives an illustration of the relevant period over which a measure of inflation is needed to allow the measurement of the risk-free element of the WACC net of inflation.

11. In Oxera's illustration, what is needed is a measure of an average 10-year inflation rate assumption that a marginal bond trader would have been using five years ago.

12. This single illustration is not representative: it represents one extreme case.

13. Energiekamer has told us that 10-year bonds were issued frequently, so that there was no need to rely on data for bonds close to their maturity. Thus, the other relevant extreme to consider is the case of a 10-year inflation forecast made recently by a bond trader dealing in recently issued 10-year bonds.

14. The reference periods implied by the possibilities between the extremes outlined above might include any time from about 2005 to 2019.

15. Whilst all the data relate to the perceptions of investors in the past, a large part of these perceptions are about the rates of inflation to prevail at times that are, at the time of writing (2010), in the future.

Oxera's specific data sources and calculations for inflation

16. Overall, the inflation rate calculated by Oxera is reasonable.

17. However, whilst Oxera's principles in respect of inflation are sound, there is something of a gap between the principles and the practice in Oxera's report.

18. Oxera discusses four possible sources for the inflation assumption:

    (a) Past inflation (which Oxera calls "realised inflation").

    (b) Forecast inflation.

    (c) Implied inflation (from index-linked bonds).

    (d) Target inflation (as used by the ECB).

19. Oxera makes a credible case that forecast inflation data are unreliable and that past forecasts about inflation in periods that are now in the past should be discarded in favour of actual past inflation, on the reasonable assumption that there was no known bias in bond investors' inflation forecasts.

20. Oxera rejects the use of index-linked bond data on the grounds that they do not relate to the Netherlands CPI and that markets for index-linked bonds might be affected by factors other than inflation expectations — an example of such a factor is the regulatory pressure on UK pension funds to invest in UK Government index-linked bonds. These arguments are reasonable, if perhaps not overwhelming.

21. Oxera rejects the use of target inflation on the grounds that it is only a long-run average. This is a weak argument given that inflation assumptions are needed over the usually relatively long period to redemption of a 10-year bond. Better arguments against the use of target inflation are that:

    (a) The phrase "below, but close to 2%" does not actually provide an unambiguous figure to use in calculations.

    (b) Insofar as returns are expected to be correlated with inflation (an assumption that underpins the form of control used for energy networks in the Netherlands), the use of a fixed target would amount to giving up the opportunity of combining fluctuations in inflation and returns within the relative period so as to reduce exposure of the price control parameters to economic volatility.

22. To combine these data sources, Oxera first says that:

> [Oxera's] proposed methodology places some weight on realised inflation (in addition to available forecasts).

23. This is presumably intended to be an application of the argument that actual past inflation is a more reliable measure than past forecasts of past inflation, which we outlined above. To that extent, it makes sense.

24. But what Oxera "more specifically" proposes contradicts the words quoted above. Oxera actually places more weight on actual inflation data than on available forecasts. In Oxera's table 2.5, all the numbers quoted (excluding the average column) have essentially the same impact on the final proposals, and only two out of these nine numbers are forecasts.

25. Oxera's specific proposals are inconsistent with the reasonable interpretation of the assertion that a combination of past inflation and forecasts would be consistent with the principles outlined at the beginning of Oxera's section 2.4. By using only 2010 forecasts (one-year forecasts), Oxera is effectively limiting the times at which it considers inflation to the six years from 2005 to 2010, instead of the 15 years from 2005 to 2019 that the principles imply.

26. In the light of this impact on the period considered to estimate inflation, Oxera should have revisited its reasons for disregarding longer-term forecasts (IMF and ECB forecasts, evidence from index-linked bonds, ECB target).

27. The main reason for disregarding these data was that they relate to European average inflation measures rather than to Dutch CPI.

28. The lack of specific Dutch data seems a poor reason for disregarding more than half of the relevant time window, and for using an average based overwhelmingly on past data in order to estimate inflation in a period of which the greater part is in the future.

29. Fortunately, this appears to have a small effect on the value of the inflation parameter. The range of figures obtained by Oxera's method is consistent with reasonable forecasts of future CPI inflation in the Netherlands.

30. In December 2009 the CPB only had inflation forecasts available for the one year in the future to 2010. In March 2010, CPB released an updated forecast for the period 2011–2015, which is 1.5 per cent a year. Whilst Energiekamer is right to set a December 2009 cut-off date for data sources to facilitate scrutiny of its methods by stakeholders, it is worth noting that updating Oxera's work by adding this forecast for 2011–2015 to the set of numbers being averaged would have a very small effect on the results (after correcting for the updating error noted elsewhere in this paper).

31. Therefore, whilst the method followed by Oxera to calculate the inflation parameter may have unduly dismissed future forecasting, the results are nevertheless reasonable.

Failure to update the inflation data

32. As Netbeheer Nederland points out, Oxera is using out-of-date data in table 2.5: annual figures relate to a period from June to May even though the table was prepared in or after December 2009.

33. Netbeheer Nederland's recalculation of the average using more recent data changes the result by 0.1 per cent.

34. The inflation numbers provided by Netbeheer Nederland are consistent with the average year-on-year inflation from December to November using CBS data. Updating the WACC calculation with the new range of inflation of 1.5 per cent to 1.6 per cent provides a new WACC range of 5.37 to 7.04 per cent under Oxera's method, and therefore a midpoint of 6.2 per cent.

35. Table 1 gives a corrected calculation of the inflation parameter following Oxera's method. We have recalculated actual inflation from published CBS data, and used

forecast inflation data from the Oxera report. Our results are the same as Netbeheer Nederland's.

Table 1 Updated inflation data

	2005 actual	2006 actual	2007 actual	2008 actual	2009 actual	2010 forecast	Average
Two-year estimate				2.5	1.2	1.0	1.6
Five-year estimate	1.6	1.3	1.5	2.5	1.3	1.0	1.5

Note: Actual annual inflation is calculated as the average of monthly year-on-year inflation rates from December to November.
Sources: CBS and Oxera reports.

Use of the Fisher equation to adjust rates of return for inflation

36. Oxera uses the Fisher equation to determine the WACC net of inflation from the nominal WACC:

$$[\text{WACC net of inflation (Fisher)}] = (1 + [\text{WACC}]) / (1 + [\text{inflation}]) - 1$$

37. This is the same approach that was used by Frontier Economics in previous reports to Energiekamer's predecessor.[3] None of these reports appear to justify this use.

38. In the context of the regulatory regime operated by Energiekamer, the use of the Fisher equation appears to be justified by the fact that the return on capital is calculated in each year on the basis of the regulatory asset value at the end of that year, and therefore incorporating inflation through the year.

39. If the convention had been to calculate the return on the basis of the asset value at the start of the period or on average over the period, then the Fisher equation would not have been applicable.

Interactions between inflation and tax

40. Energiekamer has chosen to use a pre-tax WACC, based on the official rate of tax, rather than direct modelling of the cost of tax after allowances. Oxera's approach to adjusting the WACC for tax is reasonable, given the low level of variability in inflation data and forecasts.

41. Oxera's calculation of a pre-tax WACC is based on the following implicit assumptions:

[3] Frontier Economics (2005) The cost of capital for regional distribution networks, report for DTe, December, http://go.reckon.co.uk/b14385 (PDF), page 54; Frontier Economics (2008), Updated cost of capital estimate for energy networks, report for DTe, April, http://go.reckon.co.uk/b50663 (PDF).

(a) Tax is calculated on the basis of total nominal returns, including gains from the application of inflation to the regulatory asset base.

(b) The cost of debt (as measured on bond markets) is inclusive of tax, because returns to debt investors are tax deductible for the company (tax is paid by the debt investors).

(c) The cost of equity (as measured using techniques like CAPM) is exclusive of tax, because profits net of the cost of debt are subject to corporation tax.

42. These assumptions seem reasonable. By applying the tax wedge on a nominal cost of equity before adjusting for inflation, Oxera has avoided the potential error of failing to cover the cost to investors of the tax due on their gains from inflation.

43. This said, a more rigorous application of the assumptions outlined above could give a different final answer from Oxera's in cases where there are grounds to use different inflation rates in respect of the period over which the risk-free rate is measured and the period of the price control. Specifically, it would be logical for the tax allowance to be calculated on the basis of an estimated future cost of equity that reflects estimated future inflation over the price control period, rather than on the basis of a nominal cost of equity related to a different period.

44. The impact is negligible provided that there is no large difference between the two relevant inflation rates; on Oxera's data, there is no large difference: both figures are around 1.5 per cent to 1.7 per cent.

45. Given the lack of difference between expected future inflation and the inflation rate used to strip inflation from the risk-free rate, the use of only one inflation rate is reasonable.

Impact of inflation on the WACC

46. Oxera's method for calculating the real pre-tax WACC places the inflation value of 1.6 in the low calculation and 1.7 in the high calculation. The rationale for this seems to be an alignment of the period of measurement with the risk-free rate, tying in two-year averages with two-year averages and five-year averages with five-year averages. This approach is reasonable.

47. A possible criticism could be raised if the high and low sections were intended to calculate the highest possible values for the WACC respectively. In this case, the method would be incorrect as the inflation rate has a negative impact upon the final WACC determination. A higher inflation assumption leads to a lower WACC, and it should therefore be applied in the low scenario to maximise the WACC value.

48. Perhaps the decision could state more clearly that high and low values of the WACC do not correspond to the highest and lowest plausible values.

Gearing

Overall materiality of the gearing assumptions

49. Within the method adopted by Oxera, the level of gearing has a minimal impact on the level of the WACC due to the Modigliani-Miller formula used to transform the asset beta into the equity beta.

50. With the specific version of the Modigliani-Miller formula adopted by Oxera, the only impact of a different level of gearing on the WACC is the tax effect upon the inflation part of the return on equity. A higher gearing assumption leads to a slightly lower calculated WACC.

51. This effect is small when the assumed inflation rate is modest. Therefore, we think that the impact of gearing assumptions on WACC estimates is reasonable.

Oxera's approach

52. Gearing is the level of debt capital relative to total capital within a company. It is relevant to the WACC calculation because debt and equity capital incur different costs and therefore the weighting for the cost of capital is based upon the gearing assumption.

53. In fact, the gearing assumption has three roles within a WACC analysis of the kind used by Oxera and Energiekamer:

    (a) Gearing is used to convert the asset beta into an equity beta.

    (b) Gearing provides the weights in the WACC formula.

    (c) Gearing is linked to the debt premium, possibly through credit ratings.

54. Oxera focuses on the third role — the risk associated with debt, measured through credit ratings — in order to determine the gearing assumption to be used in the first two roles.

55. Whilst this is a reasonable approach, it would have been prudent to check that the assumption used was consistent with the other two roles of gearing and with the notion that companies optimise their capital structure to, in the simplest models, minimise their WACC.

Oxera's estimates

56. On page 16 of the methodology paper, Oxera refers to a maximum gearing level of 60 per cent, or 70 per cent under special circumstances, which applies to energy networks under an unbundling law. Although greater levels of gearing could be achieved by raising debt through a parent company, this is not a serious criticism of Oxera's work since Oxera's analysis in section 3.2.2 does not take account of the 60 or 70 per cent maximum gearing.

57. According to Oxera, two of the key questions for determining the level of gearing are:

(a) What is the appropriate target credit rating?

(b) What gearing assumption is consistent with this target credit rating?

58. Oxera does not provide sufficient reasoning to justify its exclusive focus on credit rating agencies. Whilst credit ratings could be considered to provide a reasonable reflection of risk for utility companies, the recent criticisms of the ratings of financial products and institutions following the credit crunch means that this part of the method is vulnerable to legitimate attacks.

59. Oxera asserts, based on a qualitative review of comparators, that a BBB credit rating indicates an exceedingly risky capital structure. This analysis seems to be the real basis for the upper bound of 60 per cent gearing proposed by Oxera. This is a reasonable approach. On Oxera's data, choosing a BBB credit rating would have led to a 67 per cent upper estimate for the gearing.

60. A detailed examination of the basis for Oxera's numbers reveals some shortcomings, at least in the presentation of the analysis.

61. Oxera constructs a lower bound of 50 per cent for gearing on the basis of an average debt to market value ratio for the same set of comparator companies whose average debt to regulatory asset base ratio is 60 per cent. The large difference between these two measures is left uninvestigated. It seems to be caused in part by differences in data availability: the North American comparators have low levels of gearing (market value) and have no data for the gearing relative to a regulatory asset base.

62. We do not understand Oxera's stated grounds for disregarding Ofgem's 65 per cent gearing assumption. Oxera says that this is due to debt outside a regulatory ring-fence; although it is difficult to ascertain exactly what this means. Presumably they are referring to the fact that regulated activity is separated from non-regulated activity within these companies, meaning that the actual regulated activity is funded by less than 65 per cent gearing. Either way, there seems to be little justification for dismissing the gearing assumption of Ofgem for this reason; whether or not ring-fencing is used a regulated company can still hold a level of debt at the 65 per cent.

63. On the data presented, it appears that the disregard of high gearing figures is due to the fact that Ofgem's view of an efficient financing structure involved a higher level of risk than what Oxera thinks best for Dutch networks. Stating this would have been a sufficient reason to disregard Ofgem's figure.

64. Overall, we think that Oxera's figure of 50 per cent is not well supported, but the figure of 60 per cent is adequately explained.

65. However, gearing can be chosen by a company and hence the upper estimate is arguably the only one that really matters since, on Oxera's assumptions about beta, inflation and tax, a higher level of gearing leads to a slightly lower WACC. Oxera provides sufficient evidence to suggest that a level of gearing of 60 per cent is a cautious level of gearing, and is arguably achievable by all companies, and therefore it is appropriate to use that higher level of gearing in all calculations.

Oxera's use of its gearing range

66. Oxera has attributed the high and low gearing values to the high and low WACC scenarios in an unnatural way. A higher gearing leads to a lower WACC, and would therefore naturally be in the low WACC scenario.

67. There might be an argument that the uncertainty about gearing might be correlated with the uncertainty about the debt risk premium. But that is not obviously true, and nothing in Oxera's report suggests that such a correlation is being assumed.

68. Additionally, since the high and low estimates of the WACC do not refer to the highest or lowest possible values, as discussed earlier in the inflation section, it is not necessary to attribute gearing as high or low depending upon its impact on the WACC. Further, the combining of the high and low estimates is a commonly adopted practice. These arguments are weak. Arguing that something has been done before and should therefore be done again is not a convincing reason to justify a seemingly illogical result.

69. The impact of the misallocation of the high and low gearing values to the high and low WACC scenarios is very small.

Risk-free rate

70. For the risk free rate, Oxera applies the methodology used in previous decisions, which seems reasonable.

Debt premium

71. Oxera uses measured spreads for general corporate bonds (five-year average) and for a group of comparator companies (two year). This is a reasonable approach.

72. It is not clear whether the relevant risk-free rate used is calculated from the comparator's own country or whether the Dutch risk-free rate is used. Whilst we believe that this has been done correctly, the lack of documentation creates a perceived risk that the wrong rate has been used in some of the calculations.

73. Several changes have been made to the comparator group since the previous determination.

74. The method of selecting a comparison company does not appear to consider the level of gearing for the said company. This would have been a reasonable cross-check on the suitability of the comparator group since the gearing of a company is a factor that can influence its debt premium. For example, one might expect the range of values for the debt premium to be consistent with the range of values within the gearing assumption.

75. For the majority of the debt premium comparator companies, data on gearing are not given within the Oxera report. Failure to demonstrate that the comparators had a level of gearing similar to that assumed elsewhere in the calculation of the WACC is a

vulnerability of the analysis as it would have been prudent, and relatively simple, to perform such a check.

Debt issuance costs

76. The debt issuance cost estimates consider the experience of UK and Australian regulators and use this, along with other information, to form a view of the allowance for such costs.

77. Overall, Oxera's estimate of debt issuance cost is likely to be perceived as reasonable, albeit on the high side, although it has no real objective means of support.

Market risk premium

78. Oxera decided to stick with the range determined in the July 2009 paper, which is the same range that was determined in 2005 by Frontier Economics.[4] Frontier Economics' range was derived after a review of historical returns (geometric and arithmetic averages of Dutch, US and world returns), and ex ante measures such as dividend growth models and survey results.

79. Oxera quotes updated data from the Dimson, Marsh and Staunton study, together with survey data on the expected forward-looking market risk premium. Oxera says that the evidence is mixed and that it is appropriate to stick with the range used for previous determinations. Therefore the range is still based on evidence, in the 2005 Frontier Economics report, from the geometric and arithmetic averages of historical returns on equity.

80. We do not consider that it is reasonable to take the geometric average into account in the context of setting the WACC for a price control review. Our detailed analysis of this issue follows.

81. Despite these concerns, we do not assert that the figure used by Energiekamer for the market risk premium is an unreasonable one. Our issue is with the robustness of the stated method and the reasons given for it, not with the result.

Reasons given for relying on a geometric average

82. The justification given in the 2005 report by Frontier Economics says:[5]

> The Smithers report for the UK regulators concludes that it has no strong preference for either approach but cautions that one should be aware of the potentially significant differences between the two. The authors of the report note that there are plenty of influential academic economists expressing views in favour of using each method.

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[4] Frontier Economics (2005) The cost of capital for regional distribution networks, report for DTe, December, http://go.reckon.co.uk/b14385 (PDF).

[5] Frontier Economics (2005) The cost of capital for regional distribution networks, report for DTe, December, page 36, http://go.reckon.co.uk/b14385 (PDF).

> In summary, there is concern that historic estimates based on annual arithmetic means will overstate the forward-looking ERP. As a result, it is sensible to take account of both arithmetic and geometric means in forming a view of the appropriate ERP.

83. We disagree with the interpretation that this places on the Smithers report.[6] The Smithers report provides a careful analysis of the differences between arithmetic and geometric averages from different points of view, and concludes that:

(a) The arithmetic average is "conceptually superior" in the context of measuring returns on capital.

(b) The arithmetic average is "possibly less stable". This is because it is likely that the probability distribution of returns is asymmetric, with a greater probability of large profits than of large losses, and therefore the estimator of the geometric mean (which is likely to be close to the median) is less noisy than the estimator of the arithmetic mean.

(c) The two measures are different and the difference between them "can be significant—as much as two percentage points or more".

84. The question is what these findings imply for the estimation of the market risk premium for regulatory purposes. We think that the correct inferences are as follows:

(a) In analysing historical data on stock market return, most attention should be paid to the geometric average (or compound growth rate). Variations in this figure are less likely to be completely random fluctuations than variations in the arithmetic mean.

(b) What is needed to estimate a WACC in order to set an allowed revenue figure is an estimate of the arithmetic expectation value, which gives equal weight to instances of high profits as to instances of low profits or losses. The geometric expectation value is an estimate of compound capital growth rate and is irrelevant in this context.

(c) To estimate the arithmetic expectation value, given the potential noise in historical arithmetic mean data, a good method is to combine a historical geometric mean with an estimate of the gap between arithmetic and geometric means. Obviously there is no miracle: the uncertainty is still present in the estimate of that gap; but expressing the arithmetic expectation value as the combination of the geometric mean and that gap is a more transparent way of reporting that uncertainty.

85. The relevance of the last point is confirmed by the use of that method in a follow-on report by Smithers (and the same authors) for Ofgem in 2006, where the market return was estimated as follows:[7]

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[6] Wright et al. (2003) A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Smithers & Co, February, http://go.reckon.co.uk/s49052 (PDF).

Real Market Return: Compound Average: 5.5 per cent

Adjustment to Arithmetic Average: 1 to 2 per cent

Real Market Return: Arithmetic Average: 6.5 to 7.5 per cent

86. We therefore conclude that Oxera's report does not justify its reliance on an average of the arithmetic and geometric means.

Further analysis of the differences between geometric and arithmetic averages

87. Geometric and arithmetic averages measure different things.

88. A separate arithmetic average can be calculated for each data periodicity, for example daily or weekly. The arithmetic average relates to the position of an investor who liquidates any capital gain from its equity portfolio in each period, so that its invested capital is constant. The arithmetic average is the expected amount of annual income from this portfolio, divided by the constant amount of capital employed.

89. In contrast, the geometric average envisages the position of an investor who immediately reinvests any income from its equity portfolio into equities. The geometric average is calculated using an average of the logarithm of the growth in the portfolio, and represents the most likely annualised rate of growth observed on this portfolio (in the long run).

90. If there is any volatility in returns, then all arithmetic averages are greater than the geometric average.

91. There are two main reasons for this difference, both related to the volatility of market returns: if there was no uncertainty and no variability in returns, then all these averages would be the same.

92. The first effect arises from the concave character of the logarithm function used in calculating the geometric average: the average of the logarithm (which is used for the geometric average) is always less than the logarithm of the (arithmetic) average.

93. The concave character of the logarithm function is related to the asymmetry in the probability distribution of the growth rate on a portfolio with income reinvested, when measured over a long period of time, even if the return in each short period was symmetric.

94. The asymmetry arises from the fact that there is a greater likelihood of very high gains than of very high losses. This is unsurprising since the nature of equity investment is that the capital cannot fall by more than 100 per cent, as it cannot become negative, whereas it can increase by more than 100 per cent. If the distribution of short-run returns has a finite variance and no long-run serial

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[7] Wright et al. (2006) Report on the cost of capital, Smithers & Co, published by Ofgem, September, http://go.reckon.co.uk/s18460 (PDF).

correlation, then the specific asymmetric distribution followed by long-run returns is a lognormal distribution.

95. The second effect arises from negative serial correlation in market returns. Such correlations would be expected, for example, if equity prices frequently "overreact" to news and then correct themselves. In the presence of negative serial correlation, an arithmetic average using a period short enough to display serial correlation will be greater than the geometric average, and an arithmetic average using a short period will be greater than one using a longer period. This second effect is usually (and reasonably) cited as evidence for the proposition that the arithmetic average is too high.

96. CAPM is a single-period model, and it assumes that investors have the opportunity of rebalancing their portfolios (including rebalancing between cash and equities) in each period. Thus, the arithmetic average is the one that is relevant to CAPM.

97. CAPM also relies on the assumption that investors have no way of forecasting short-term market movements (any such knowledge would lead to arbitrage, which under CAPM's assumptions would remove the serial correlation). Thus, under CAPM's assumptions, there can be no serial correlation in returns, and therefore the arithmetic average should be independent of the period used to collect the data.

98. If there is serial correlation in reality, then some assumptions of CAPM do not apply, and it can be argued that any reliance on CAPM in this context will be open to criticism.

99. Using the geometric average to set the WACC in a price control context on grounds of serial correlation implies a rejection of the assumptions underpinning CAPM.

100. In fact, any reliance on geometric averages implies that a model of risk and return different from CAPM is being used.

101. Whilst it might be reasonable to try and adjust only for short-run serial correlation by seeking to estimate what the average would be over a long enough period to remove the effect of serial correlation, this is not the same as relying on a geometric average. By using a geometric average, the return is adjusted for the first effect identified above (related to asymmetry in the risk distribution), as well as for serial correlation.

102. Reliance on a geometric average would amount to removing part of the return on the asymmetry of risk that is modelled within CAPM. Such a modification to CAPM would not be reasonable.

103. Reliance on an unadjusted geometric average would amount to removing part of the return on the asymmetry of risk that is modelled within CAPM. Such a modification to CAPM would not be reasonable.

104. In our view, in the absence of any solid information about the relative magnitude of the first and second effects above, there is no valid case for choosing a half-way point between an arithmetic and a geometric measure in the hope of correcting for the second effect without undue distortion from the first effect.

105. In summary, and notwithstanding the fact that there are regulatory precedents of referring to geometric means in estimating a market risk premium, we do not think that reliance on an unadjusted geometric mean is reasonable.

Impact on the market risk premium

106. The above section has argued that it is not correct to place equal weighting between the geometric and arithmetic average of returns in the context of estimating the market risk premium for a regulatory price control. Doing so risks setting a market risk premium that does not provide investors with adequate compensation for investing in a companie's equity. However, in the context of the figures analysed by Oxera, this risk has not materialised to the same extent: the estimated market risk premium used by Oxera is a plausible value, even if the method used to determine it is open to criticism.

107. To confirm the plausibility of Oxera's estimate, we have referred to figures cited in Oxera's quantitative analysis, combined with the approach put forward by Wright et al. (2003) of calculating the geometric average and adding an adjustment for the arithmetic average.[8]

108. We have focused on the returns of equities over bonds in the Netherlands. The use of bonds (rather than bills) as the reference risk-free rate is consistent with Energiekamer's approach to CAPM and the WACC.

109. On that basis, the historical figures quoted by Oxera are 5.6 per cent a year for the arithmetic average and 3.2 per cent a year for the geometric average. Wright et al. (2003) suggests a range of 1 to 2 per cent for the adjustment to derive the arithmetic average from the geometric average. Wright el al. (2003) states that the difference between the geometric and arithmetic average is given by the square of the volatility of log returns divided by two, which equates to a difference of about two percentage points if the volatility is 0.2, which is a plausible figure according to data from Dimson, Marsh and Staunton. Wright el al. (2003) relies on a model of serial correlation of returns to support the proposition that the gap may be only one percentage point.

110. Combining these estimates gives a range for the market risk premium of 4.2 to 5.6 per cent. Thus, there is no major conflict with the range of 4 to 6 per cent presented in Oxera's report.

Asset beta

111. In respect of the asset beta, whilst we set out some criticisms of the method below, we think that the values reached appear reasonable in light of the information available.

[8] Wright et al. (2003) A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Smithers & Co, February, http://go.reckon.co.uk/s49052 (PDF).

112. For the asset beta, Oxera uses the same approach as in previous determinations by Energiekamer, based on a two-year average with daily returns data and a five-year average with weekly data on a group of comparator companies.

113. The selection of this group has arguably focussed too heavily on North American companies, which face different regulatory conditions to that of Dutch network companies.

114. The inclusion of US and Canadian companies is a risk to the method since the regulatory system faced by them, cost of service, is different to the price/revenue cap systems of Dutch network companies.

115. This argument is identified in the Oxera report which acknowledges the lower risk faced by a cost of service regulatory regime due to the nature of cost recovery within such a regime. Oxera's report argues that, whilst the risk might be lower for US and Canadian companies due to their regulatory regime, the risk of unbundling is higher for them, which could even out the risk level between them and Dutch companies. This argument is weak; the risk of greater unbundling does not seem a risk to a network company. Either way, there is nothing to say that these supposedly countervailing effects even out or that these companies provide useful comparisons for Dutch companies.

116. In updating the comparator set, Oxera have added comparators that are predominantly from the US. It also removed non-US comparators on the basis that their circumstances have changed. In some instances this is justified, such as where there is a much lower proportion of energy network activity. But the removal of Envestra on the sole ground of a slightly higher level of gearing is less justifiable.

117. More generally, there seems to be little consistency on the treatment of gearing. Companies with gearing above the assumed gearing level for the WACC calculation are removed whilst companies with gearing below are included.

118. These defects of the selection method and the overall shift of the balance of comparators in the update open the method to challenges. There is no simple adjustment that can be made to the results to address this risk. The re-inclusion of Envestra would have little effect on the average.

Overview of comments from stakeholders

119. Energiekamer received comments from Netbeheer Nederland and from two companies, Delta and Rendo. Table 2 gives a summary of the points made.

Table 2 Summary of electricity DNO comments on WACC

Company	*Comments*
Netbeheer Nederland	The inflation parameters have only been partially updated, since the reference periods between it and the risk-free rate are not harmonised. Assuming that this mistake is rectified, the WACC should be updated to 6.2 per cent.

Company	*Comments*
Delta	Uncertainty about how "objectifiable regional differences" (ORD) are treated, in terms of late payment or non-recognition, places some network operators under a considerably higher risk than others. There should be a compensation for this risk through the WACC.
Rendo	A regulated company must sometimes make investments related to new connections that are unprofitable due to statutory obligations. It is unlikely that all companies will be equally affected. This risk should be reflected in the WACC. This could replace the provision for the miscalculation of the change in productivity. There is concern with Energiekamer's suggestion that a cost of equity above market returns could be contrary to the objectives of the legislator. This is because the calculation of any WACC parameter value, and hence the WACC itself, is not an exact science, as shown by the use of a range, and therefore it cannot be proven that a number, such as 6.5 per cent, is not a market return. The range should be used as a means for determining plausible market returns.

Netbeheer Nederland's comments

120. Netbeheer Nederland points out that actual inflation data have not been updated in line with the forecast for 2010 for data in December 2009. They therefore propose that the data should be taken as year-on-year inflation from December to November.

121. We agree with Netbeheer Nederland: see the inflation section of this report.

Delta's comments

122. Delta argues that Energiekamer's approach for dealing with objectifiable regional differences results in an asymmetric regulatory risk and that this risk should be reflected in the WACC.

123. Delta's argument is that the full compensation of objectifiable regional differences is not certain and therefore, whilst they are there to recover costs incurred due to regional differences, there is no certainty that this part of cost recovery will be fully compensated. Therefore, companies with objectifiable regional differences that lead to higher tariffs face a higher potential risk of not fully recovering costs compared to other companies.

124. In order for this regulatory risk to justify an increased WACC in compensation, there must be evidence that the comparators used within the calculation of the WACC, for example for the calculation of the beta parameter, do indeed face a lower level of regulatory risk. To put it another way, it must be shown that an allowance for this fact has not already been made within the comparison groups used in the WACC calculation process. Delta does not establish this.

125. All that seems to follow from Delta's point is that different Dutch companies, with different exposure to objectifiable regional difference risks, should be given different levels of return on capital.

126. However, the Dutch regulatory system applies a generic WACC to all companies. Energiekamer has told us that this follows from the Gas and Electricity Acts. Therefore, the comments from Delta would seem to have no bearing on the WACC determination.

Rendo's comments

Obligation to make unprofitable investments

127. Rendo says that:

(a) Being a regulated company obliges them to potentially make new connections which are unprofitable, both financially and socially.

(b) The risk created by this should be reflected in an increase in the WACC.

128. The argument would seem to rest on the fact that, with a few exceptions, new connections are charged at a fixed rate in the Netherlands. This leads to the possibility that some networks could have to make more expensive connections but receive the same amount of revenue.

129. Energiekamer has told us that any relevant differences between the levels of unprofitable investment across companies would be dealt with through an objectifiable regional difference.

130. However, there is a risk that there will not be enough evidence to support an objectifiable regional difference, in which case the company would be forced to make less profitable investments.

131. Even so, this would not justify increasing the WACC under Energiekamer's approach. Insofar as the risk or loss is company-specific, the need to use a single WACC for all companies would prevent an adjustment. Furthermore, the risk seems to be non-systematic and therefore diversifiable by an investor, meaning there is no reason to increase beta.

Use of "unreasonable return" and "contrary to the legislator's objective"

132. Rendo objects to the discussion in Energiekamer's draft decision on the treatment of company specific risks.

133. Rendo highlights the following paragraph in the draft decision, bringing special attention to the last sentence:

> With regard to the aforementioned arguments, the Board has considered the following. Using CAPM, it is possible to calculate a compensation for all market risks an undertaking incurs. An investor can eliminate risks unrelated to market risk, so-called business-specific risks, by having an investment portfolio (reasonably sized and diversified), so the investor only needs to be compensated for market risks. Theoretically speaking, adjustment of the WACC would therefore be undesirable, given the specific risks of the Dutch energy industry. **Furthermore, it would lead to the network operators earning a higher return than market revenues, which would be contrary to the objectives of the legislator.**

134. Rendo puts forward the view that any WACC that falls within the range of possible WACC values should be considered to be potentially consistent within the legislator's objectives.

135. We agree with Rendo's assertion that any value within the range is reasonable and therefore potentially consistent with the objectives of the legislator. However, the paragraph highlighted by Rendo from Energiekamer's draft decision is referring to the fact that business-specific risks should not be compensated within the WACC. If these were compensated, then this could lead to a WACC which provides a higher than market return. This would imply that whilst any number within the range could be considered reasonable, and hence in line with the legislator's objective, the same cannot be said were the range to be adjusted upwards in order to take into account business-specific risks.

136. Rendo does not provide any argument against Energiekamer's choice of estimate within the range, merely pointing out that since 6.5 per cent is in the range then it could not be proven that 6.5 per cent did not constitute a market return. Whilst this is true, it does not provide any reason why 6.5 per cent is a superior estimate to Energiekamer's WACC estimate.

137. Furthermore, we agree with the logic of the argument presented by Energiekamer explaining why no adjustment has been made for specific risks of the Dutch energy industry since, under CAPM, only risk that cannot be diversified within a market portfolio attracts a premium in returns. Therefore Energiekamer's WACC estimate seems reasonable.

Our opinion

138. Provided that the calculations are corrected to take account of updated CPI data, we think that the estimates used for each of the parameters in the WACC calculation are reasonably supported by evidence.

139. We have identified some areas in which the methods used or their presentation might be improved. Most importantly:

    (a) An unadjusted geometric average of the return on a market portfolio is not relevant to the estimation of the market risk premium. Arithmetic averages, or geometric averages adjusted to take account of the effect of volatility on average returns, must be used instead.

(b) In principle, more account should be taken of expectations about future inflation over the next 10 years (to match the term of bonds used in the estimation of the risk-free rate). Energiekamer's draft decision places excessive reliance on past CPI data. This issue would only have a material impact on the results if inflation was expected to change significantly in the next 10 years.

(c) Gearing is a parameter that each company can choose. For the purpose of estimating the WACC, an achievable gearing value for a hypothetical capital structure consistent with other parameters in the calculation should be used. There is no need to attempt the estimation of a range of reasonable gearing values.

(d) The range of values used for several of the parameters (most obviously beta) do not fully reflect the uncertainty that exists about these parameters. In determining the return to be allowed in price controls, Energiekamer will need to be aware of the fact that the rate of return that investors reasonably require might well fall outside of the range established in the work that we have reviewed.