



# **Second opinion on the WACC for the Dutch Gas Transmission System**

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<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Cost of capital methodology</b>	<b>3</b>
<b>3</b>	<b>Risk-free rate</b>	<b>5</b>
3.1	<i>EK approach to risk-free rate</i> .....	5
3.2	<i>Stakeholder comments</i> .....	5
3.3	<i>Assessment</i> .....	5
<b>4</b>	<b>Equity risk premium</b>	<b>9</b>
4.1	<i>EK approach to ERP</i> .....	9
4.2	<i>Stakeholder comments</i> .....	9
4.3	<i>Assessment</i> .....	10
<b>5</b>	<b>Beta estimation</b>	<b>15</b>
5.1	<i>EK approach to beta estimation</i> .....	15
5.2	<i>Stakeholder comments</i> .....	16
5.3	<i>Assessment</i> .....	17
<b>6</b>	<b>Gearing and debt premium</b>	<b>27</b>
6.1	<i>EK approach to gearing and debt premium</i> .....	27
6.2	<i>Stakeholder comments</i> .....	28
6.3	<i>Assessment</i> .....	28
<b>7</b>	<b>Inflation and tax</b>	<b>31</b>
7.1	<i>EK approach to inflation and tax</i> .....	31
7.2	<i>Stakeholder comments</i> .....	31
7.3	<i>Assessment</i> .....	31
<b>8</b>	<b>Overall assessment</b>	<b>33</b>
8.1	<i>WACC estimate</i> .....	33
8.2	<i>General comment on methodology</i> .....	34

8.3	<i>Cross-check of EK WACC estimates using recent European regulatory decisions .....</i>	35
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## Second opinion on the WACC for the Dutch Gas Transmission System

<b>Figure 1.</b> Netherlands risk-free rate – yield on 10 year maturity	6
<b>Figure 2.</b> Ireland risk-free rate – yield on 10 year maturity	7
<b>Figure 3.</b> Frequency of returns data and statistical precision of beta estimates	20
<b>Figure 4.</b> Effect of reference day risk on beta estimates using weekly returns data	21
<b>Figure 5.</b> Rolling median beta estimates of comparators	25
<b>Figure 6.</b> Factors affecting credit rating	29



# 1 Introduction

The Office of Energy Regulation in the Netherlands, Energiekamer (EK, part of NMa) has asked Frontier to evaluate the methodology and the estimate the cost of capital (WACC) for gas transmission.

There are two parts to this task.

- The first part is to **validate the methodology and parameters** of the cost of capital set out in the draft method decision and supporting documents<sup>1</sup>. The requirements of the task do not include any independent estimation of the parameters of the WACC but do include a review of the approach and decision taken on each parameter.
- The second part involves an **evaluation of the comments** made by stakeholders on the draft method decision.

This report represents our evaluation. The report is structured around the separate parameters of the WACC calculation. For each parameter we have considered the methodology applied by EK and the comments received from stakeholders.

In a final section we also address any issues relating to the methodology as a whole.

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<sup>1</sup> Oxera, *Cost of capital for GTS*, May 2011



## 2 Cost of capital methodology

EK adopted a methodology based on the weighted average of the cost of equity and the cost of debt. The cost of equity is estimated using the Capital Asset Pricing Model (CAPM).

Our assessment is that this is the appropriate methodology to estimate the cost of capital for GTS and for regulated networks generally. CAPM is widely used by regulators, companies and finance practitioners as the preferred method to estimate the cost of equity.

None of the comments received by EK from stakeholders questioned the use of the CAPM framework.



## 3 Risk-free rate

This section considers the estimation of the risk-free rate. This is used as an input into the calculation of both the cost of equity and the cost of debt.

### 3.1 EK approach to risk-free rate

The methodology for estimating the nominal risk-free rate is as follows:

- it is based on redemption yields of Dutch sovereign bonds;
- a bond maturity of 10 years; and
- the range for the risk-free rate established by taking the average yield over the past 2 years and past 5 years.

Using this approach the draft method decision adopts a range of 4.0% to 4.3% for the nominal risk-free rate for 2009, based on data at the end of 2008. For the period from 2011 onwards the range is 3.3% to 3.8%, based on data at the end of 2010.

### 3.2 Stakeholder comments

The analysis undertaken by Nera, on behalf of GTS, raises two comments in regard to the risk-free rate.

- First, that the approach places too much weight on the evidence from the previous two year period.
- Second, that the approach adopted for the risk-free is inconsistent with the approach adopted for the ERP.

None of the other comments addressed the estimation of the risk-free rate.

### 3.3 Assessment

Overall, we consider that the approach adopted by EK represents a suitable methodology for the estimation of the risk-free rate.

In terms of the maturity of the government bonds, a maturity of 10 years is an appropriate choice and one that is adopted by other regulators. Nevertheless, we note that there are times when it is useful to consider the evidence from shorter and longer maturities alongside the 10 year maturity evidence. For example, during the financial crisis, the slope of the yield curve can reveal information on investors' expectations about future yields.

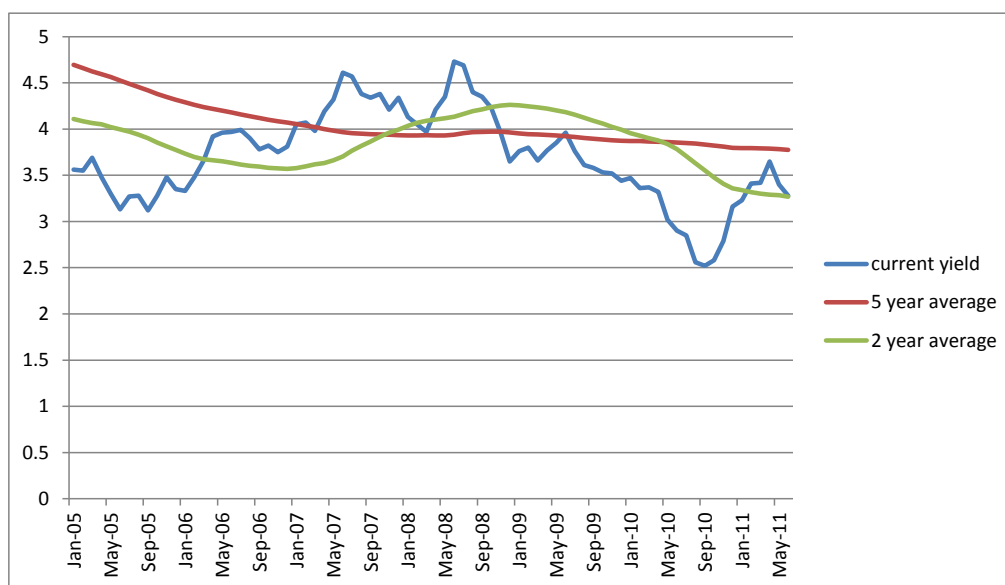
In assessing the averaging period we note the role of the WACC in the regulatory determination (i.e. for setting the rate of return in the forthcoming period) and therefore the objective to produce a forward looking estimate of the parameters.

In many situations using current market evidence will provide a good proxy for the forward looking rates. The exact methodology used by EK raises two questions:

- First, does the 2 year and 5 year average provide a suitable basis for assessing the expected risk-free rate?; and
- Second, would it be appropriate to take account of other evidence?

**Figure 1** shows the monthly data for the yield on Dutch sovereign 10 year maturity bonds. It also shows the trailing 2 year and 5 year averages, as used to establish the range for the risk-free rate. The figure suggests that the methodology provides a reasonable proxy for the risk-free rate. There are occasions where the current rate has diverged from range implied by the methodology, but these occasions have been relatively short-lived.

**Figure 1.** Netherlands risk-free rate – yield on 10 year maturity



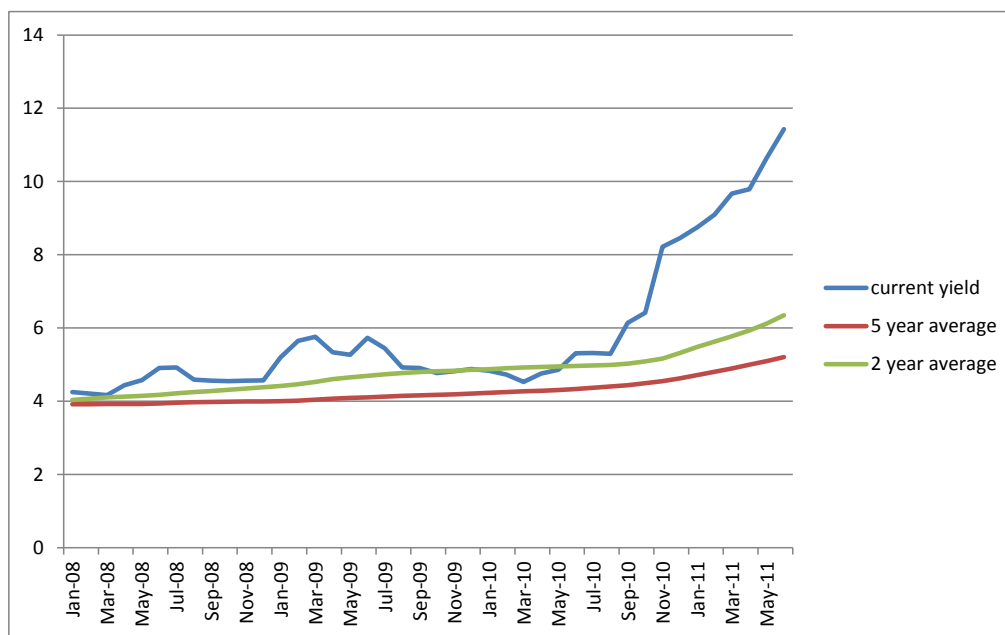
Source: Netherlands Central Bank

As a result it is not clear that Nera's criticism that undue weight has been placed on the 2 year average is valid. Clearly the EK's methodology has the effect of placing greater weight on the past 2 years of evidence than the evidence from years 3 to 5. To conclude that this was inappropriate, however, we would need to consider that this resulted in a less reliable estimate of the expected risk-free rate. This view is not supported by the recent experience in the Netherlands.

## Risk-free rate

Nevertheless, the EK's methodology may not be appropriate in all circumstances. As an example, **Figure 2** shows the same methodology applied to the risk-free rate in Ireland. The methodology has clearly not adequately captured the trend in the government yield in Ireland over the past year.

**Figure 2.** Ireland risk-free rate – yield on 10 year maturity



Source: ECB

It can be argued that the current yields in Ireland are not a good guide to future expected yields or that, in current circumstances, that the yield is not a good proxy for the underlying risk-free rate. Even so the example does illustrate that a methodology of focussing on 2 year and 5 year averages may not be appropriate in all circumstances. Therefore, it is appropriate that the regulator has sufficient flexibility so that it can, when circumstances require, amend the established methodology. In our view, given the data summarised above, an alteration to the methodology was not needed in this case.

The other comment made by Nera is that the methodology is inconsistent because the ERP and risk-free rate are calculated over different periods. We would agree that it is important that the methodology for the risk-free rate and the methodology for the ERP are consistent. However, in our view this does not necessarily mean that they should be calculated with the same time periods. In this respect the following points are relevant.

- The objective in both cases should be to establish a forward-looking estimate for the parameter.

Risk-free rate

- The evidence that is used to estimate each parameter can vary depending on data availability. It is not essential that identical time periods are used for the evidence.
- As discussed in the next section, the approach to the ERP does not just rely on the historical data over the 100 year period. The methodology also considers more current evidence.
- It is not uncommon for WACC estimates to be derived using long time series data for the ERP and shorter time periods for the risk-free rate. The case for considering historical ERP evidence over a long time frame is linked to the volatility of equity returns over shorter periods and the advantage of considering a larger representative sample of data. This argument is much less important for the risk-free rate.
- There are periods when movements in the risk-free rate and the ERP are related. As one example, during a financial crisis a fall in the risk-free rate could be associated with an increase in the ERP (e.g. an investor ‘flight to quality’). An alternative example would be where an increase in global savings reduces both the risk-free rate and the ERP. It is important that the WACC methodology is flexible enough to take account of these situations.

The methodology for the ERP is assessed in the next section.

## 4 Equity risk premium

The equity risk premium (ERP) represents the additional return, over the risk-free rate, demanded by an investor holding a diversified portfolio of equities. It is one of the key parameters in CAPM.

### 4.1 EK approach to ERP

The methodology for the ERP applied by EK relies on a mix of historic and forward-looking evidence.

- Historic data on equity returns over the risk-free rate is taken from the Dimson, Marsh and Staunton dataset. Within this dataset the evidence for the Netherlands and world index is considered.
- Survey evidence is considered from a variety of sources.
- Estimates based on a dividend growth model approach to the whole equity market are also considered.

The analysis based on this evidence indicates that a range of 4% to 6% is appropriate for the ERP. The assessment also considers whether there was evidence that the financial crisis had a material impact on the ERP and, if so, whether the range should be adjusted. The evidence considered includes data on the volatility of European equity indices and also the evidence from investor surveys. It concludes that the ERP had increased in 2009 and for that year the appropriate range is 4.3% to 6.6%

### 4.2 Stakeholder comments

The analysis undertaken by Nera, on behalf of GTS, raises a number of comments in relation to the estimate of the ERP.

- First, that Oxera's approach is unorthodox in presuming that the range used in previous decisions is appropriate unless there is a sufficient basis to depart from it.
- Second, that Oxera does not explain in detail its reasoning for not changing the ERP range in 2008, 2010 and 2011.
- Third, that there are flaws in the Oxera's estimate of the ERP using the DGM.

- Fourth, that there may be an inconsistency between the underlying range for the ERP (i.e. 4% - 6%) and the increment of 0.3% - 0.6% applied in 2009.

Energie Nederland argued that the range of 4% to 5% for the ERP would be more suitable, in line with regulatory decisions in other countries.

## 4.3 Assessment

To assist the assessment of the methodology for the estimating the ERP, we have addressed this in two parts.

- First, the approach to estimating a suitable range for the long-term ERP.
- Second, the approach for making adjustments to the long-term ERP to reflect current financial market conditions.

### 4.3.1 Evidence on the long-term ERP

In general we consider that it is appropriate to build the estimate of the ERP on a foundation of long-term evidence. There are two main reasons for this view.

First, it is difficult to produce robust estimates of the current ERP. There are flaws in the sources of evidence that can be used to generate estimates of the current ERP. For example:

- evidence from surveys can be subject to weaknesses in framing of the questions or the representativeness of the sample; and
- estimates based on the DGM are sensitive to uncertainty over future dividend growth projections.

These sources of evidence can still be valuable in estimating the ERP but they are generally not relied on to provide an estimate independent of other evidence. The Nera analysis for GTS also identified the limitations in using this evidence.

Given these estimation issues it is common practice to attach significant weight to long-term evidence on equity returns in assessing the ERP. This is adopted as best practice by regulators and companies. This evidence can provide a clear indication of the long-term value for the ERP but will not be able to identify short-term cyclical trends around that value.

The second reason is that it may not be appropriate in a regulatory determination to adjust the ERP for short-term cyclical movements, even if good evidence was available. As described above, the objective is to set an appropriate forward-looking cost of capital. The cyclical factors that can affect the ERP can be short-lived in nature and the current evidence may not be a good guide to the future. In these cases the longer-term evidence may provide a better guide to the future than the short-term evidence.

## Equity risk premium

For these reasons we consider that it is good practice to form an estimate of the long-term ERP and then consider whether the current evidence justifies an adjustment for the forthcoming regulatory period.

In the EK methodology the long-term range for the ERP is largely based on the following evidence.

- The long-term data from Dimson, Marsh and Staunton<sup>2</sup> (DMS) on historic excess equity returns for the Netherlands stock market and a world equity index.
- A sample of survey evidence on the ERP over the period 2001 to 2010.

EK's range of 4% - 6% is largely based on this evidence.

In our view this approach is reasonable and the range is consistent with the evidence presented. We have a number of specific observations on EK's approach. These observations may assist EK in developing its methodology for future reviews.

- The methodology considers DMS evidence on both arithmetic and geometric returns of equities over bonds, with a stated preference for the arithmetic mean. We note that the appropriate benchmark for the ERP is the expected arithmetic return over a suitable investment horizon. It can be argued that this horizon should be longer than one year. Studies show that this expected arithmetic return over a longer horizon is likely to lie between the historical arithmetic annual return and geometric mean return.
- The approach considered DMS evidence for both the Netherlands and the world index. Although it did not indicate a weighting attached to these two sources, we would recommend attaching more weight to the evidence from the world index. The historic returns for a specific country are more likely to be affected by the historic circumstances of that country and the data on the world index is likely to form a better guide to the future returns for a stock market in developed economy.
- We consider that the survey evidence is useful and should be included in the assessment. However, we share some of the concerns identified by Nera that the survey responses may be affected by the composition of the sample and the framing of the questions. Overall we would recommend that less weight is attached to this evidence than to the historic returns evidence. Since the range implied by the survey evidence is very similar to the range

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<sup>2</sup> For example, Dimson, Marsh and Staunton, *Credit Suisse Global Investment Returns Sourcebook*, 2011.

implied by the historic returns this does not have a material effect on the estimate of the overall range.

### 4.3.2 Adjusting for current market evidence

The methodology adopted by EK in the draft decision also considers evidence on the current trend in the ERP. This evidence consists of:

- trends in the volatility of equity indices;
- annual estimates of the ERP based on a DGM methodology; and
- evidence based on the change in survey projections of ERP.

EK conclude that the ERP had increased in 2009 but not in the other years. This conclusion was based principally on the evidence from the volatility of equity indices and the DGM estimates. The adjustment to the range for 2009, 4.3% - 6.6% was based on the evidence from the surveys.

Our assessment of this approach is as follows.

- The Oxera analysis presents evidence on both historic volatility and implied volatility (over 18 months). Of these two sources, we would recommend attaching more weight to the implied volatility. We would expect actual volatility to exhibit short-term cyclical trends. The relevant measure for the ERP is expected volatility. If equity markets are expected to be more volatile in the future then this would be associated with a higher ERP. Implied volatility provides a better proxy for this, although even then the 18 month horizon is relatively short.
- The estimates based on DGM are also a valid source of evidence. The main issue raised by Nera on these estimates relates to the assumption about future dividend growth beyond year 3. Nera comment that the estimates were flawed because analyst forecasts for dividend growth were not used for years 4 and 5 and that the long-term growth was based on GDP rather than an extrapolation of the analyst's growth projection. We would agree with Nera that the greatest uncertainty in these DGM estimates lies in the long-term projection of dividend growth and therefore we would recommend that suitable sensitivity analysis is undertaken around this assumption. On the specific points we would note the following:
  - Analysts' forecasts will become increasingly uncertain as the horizon extends and for year 4 and 5 can be based on very small samples. We would not recommend using forecasts to year 5 as a general rule.
  - Using GDP growth rates as the proxy for long-term growth will not necessarily understate the true value. Actual dividend growth can be less than GDP growth for extended time periods.

## Equity risk premium

A more general concern with the application of DGM to estimate the current ERP is that large movements in the market value of equities are likely to be correlated with changing expectations of future dividend growth. When equities fell sharply in 2009 this could have been due to an increase in investor risk aversion but also a decline in expectations about long-term dividend prospects (and it is likely to be a combination of the two). In this case the increase in dividend yield would be (partly) offset by a decline in long-term expectations. This correlation is not generally captured in the estimates. The result is that the ERP estimates from this approach may be too volatile.

Overall, the Oxera approach for applying the DGM is reasonable, although greater use of sensitivity checks would be useful.

- The evidence from these two sources does indicate that ERP peaked in 2009 and then declined. However, the evidence does not greatly assist in assessing the scale of any increase in the ERP. Oxera adopt a pragmatic approach and apply an uplift based on the change in the survey estimates of the ERP. Taking evidence on the change in ERP estimates from repeated surveys can be sensible as it mitigates any potential biases in the survey design<sup>3</sup>. Such a pragmatic approach may be justified when dealing with different sources of evidence all of which involve a degree of uncertainty.
- We also consider that the evidence presented would have been more consistent with adopting a value for the ERP from within the top half of the range, as opposed to shifting the range. This distinction may appear semantic in that it may not affect the overall WACC outcome, but it does appear to be a more logical interpretation of the data.

Overall, our view is that the Oxera analysis correctly identified that 2009 represented the peak in the short-term movement in the ERP. The report adopted a pragmatic approach to increasing the range for the ERP in that year.

### 4.3.3 Summary on ERP

The range adopted for the ERP is reasonable and is consistent with the different sources of evidence considered.

The approach adopted by EK to the ERP could be re-formulated as the following steps:

- Establishing a range for the ERP based on long-term evidence, including historical data. This would reflect the sources of evidence currently used by

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<sup>3</sup> Provided that the surveys are applied consistently over time. We understand that this is the case for the surveys used by Oxera in its analysis.

Oxera. This range should embrace the appropriate forward-looking ERP in the majority of circumstances.

- Consideration of current market evidence to assess the case for selecting a value for the ERP towards the top, or towards the bottom, of the range. This could take account of:
  - evidence on expected volatility;
  - DGM based evidence; and
  - a consistency check against the other parameters in the calculation, particularly the risk-free rate.
- This last consideration can be important as movements in the risk-free rate can be correlated with movements in the ERP (e.g. if there is a ‘flight to quality’, an increase in investor risk aversion).

We consider that this may have advantages in terms of clarity over the process for adjusting the long-term range. We suggest that EK considers this as it develops its methodology for the future.

Finally, in terms of the comment by Energie Nederland we note that decisions on the ERP by other regulators tend to lie in the range 4% to 6%. Although it appears that a greater proportion of these decisions lie in the range 4% to 5% than in the range 5% to 6%, we do not consider that this evidence by itself is sufficient to adjust EK’s current range.

## 5 Beta estimation

Beta measures the sensitivity of company returns to changes in market returns. It reflects the business's exposure to systematic (non-diversifiable) risk. Beta is estimated by regressing the business's returns against returns on a suitable market index. In order to calculate the business's returns, it is necessary to have traded share price data.

### 5.1 EK approach to beta estimation

In principle, beta should relate to the activity of interest. When the business under regulation is not quoted, or when it is a division of a quoted company that is being regulated, there will be no share price data that can be used to calculate the business's returns. In such circumstances, it is common to use proxy data from comparator firms. EK has used such a comparator approach to estimating the beta for GTS.

The main steps taken by EK when following the comparator approach were:

1. **Compile a sample of possible comparators.** When determining the suitability of comparators for inclusion in the sample, EK considered three main selection criteria: comparability of *business mix*; sufficient *liquidity* of the traded stock; and similarity of *regulatory framework*.

In addition, EK excluded any firms that did not have share price data for “at least the majority of the estimation period”, as well as those firms with “high” gearing.

This led to a sample of 19 European, Australian and North American comparators, though not every company was used to estimate the beta for each of the years considered (e.g. due to data availability, or because of a change in business mix between 2006 and 2011).

2. **Estimate rolling asset betas for each of the comparators** (for the periods each company is included within the sample). In order to calculate asset betas for the peer companies, EK has:
  - used daily returns data over a two year estimation window and weekly returns data over a five year estimation window, thus allowing two series of rolling betas to be plotted for each company;
  - used an ordinary least squares (OLS) to regress equity returns on market returns;
  - applied a Vasicek adjustment to the estimated raw equity betas; and
  - de-levered the Vasicek-adjusted equity betas to asset betas using the Modigliani-Miller formula (assuming zero debt betas).

3. **Calculate the rolling median** of all the daily two-year betas, and the rolling median of all the weekly five-year betas.
4. **Define the upper and lower bounds of the range** for the asset beta for each year using the 31 December values of the daily two-year and weekly five-year betas from the previous year. So, for example, the upper bound of the range for 2010 was the median weekly five-year beta measured on 31 December 2009, and the lower bound of the range was the median daily two-year beta measured on 31 December 2009.
5. **Re-lever the estimated asset betas** using the Modigliani-Miller formula (again, assuming zero debt betas) and GTS's gearing.

## 5.2 Stakeholder comments

In its appraisal of the analysis conducted by EK, Nera raises three substantive points in relation to the beta estimation:

- First, Nera acknowledges that, in response to its earlier concerns, stock liquidity has been introduced as a key criterion for selecting companies for inclusion in the comparator group. However, in Nera's view the liquidity threshold applied by EK (i.e. companies with non-zero trading volumes on 90% or more of trading days within the estimation period) is too generous.
- Second, Nera argues that the impact of cash-calls and the review of the price control distort the betas estimated for some companies.
- Third, of the 19 comparator firms used for the beta estimation exercise, ten are North American firms. Nera is of the view that North American companies are unsuitable comparators for GTS because:
  - there appear to be significant operational and regulatory differences between North American and European energy companies; and
  - the estimated North American betas are more dispersed than the estimated European betas.

Nera argues that if North American companies are considered to be relevant comparators, consistency of approach by EK's advisors, Oxera, demands that the betas of the North American companies form the lower bound of the beta range. This would have the effect of increasing EK's estimates.

- Finally, the Vasicek adjustment applied to raw equity betas relies on a number of subjective assumptions about certain parameters, or the assumption that these parameters can be estimated from the comparator group, which is itself a subjective selection of companies. In contrast, the Blume adjustment requires no such assumptions.

## Beta estimation

## 5.3 Assessment

We endorse EK's use of a comparator approach to estimating GTS's beta. This is fairly standard regulatory practice. Below, we comment on various elements of the estimation approach followed by EK, and on the views expressed by Nera.

### 5.3.1 Comparator selection

We agree with the need to apply a set of criteria to selecting suitable comparator firms. Ideally, these criteria should reflect the various drivers of systematic risk and considerations of data quality. The finance literature suggests that the beta of a stock may be explained by a wide range of factors, including (but not restricted to):

- exposure of the firm's returns to aggregate demand shocks;
- financial gearing;
- operational gearing;
- opportunities for growth;
- the nature of the regulatory regime the company is operating in; and
- exposure to macroeconomic factors (e.g. inflation risk or interest rate risk).

In principle, the companies included within the comparator should be as similar as possible in all such dimensions. However, in practice, it is very difficult to achieve such consistency; striving for consistency of this kind will usually result in unfeasibly small samples. Therefore, for pragmatic reasons, the dimensions in which companies are assessed as comparators are usually restricted to the most important ones: similarity in business mix; and similarity in regulatory environment.

In terms of the business mix criterion, EK's requirement that all the included comparators must generate the majority of their earnings from energy network businesses appears reasonable to us.

We also think that Oxera's discussion of the differences between North American and European (and Australian) regulatory regimes is reasonable. It is worth emphasising that the systems of regulation in each of those geographies are not homogenous. As Oxera notes, some jurisdictions in the US and Canada are moving closer to European styles of regulation, while others have retained more traditional, low-powered incentive regimes. Furthermore, in our experience, although regulators in many European countries follow broadly similar principles, there are also non-trivial variations in approach among European regulators on certain elements that can influence the risk of regulated businesses.

We also agree with Oxera's assessment that, despite the broad differences in regulatory regimes in North America and Europe (and Australia), the mix of activities engaged in by North American energy companies can make them as risky, or even riskier, than their European (or Australian) counterparts. We disagree with Nera's implication that the additional risk to US companies from diversifying into non-regulated activities should precisely offset the relatively lower risk rate of cost of service regulation in order for North American companies to be viewed as close comparators to GTS.

We also see no objective reason why the betas of US companies should form the lower bound of the beta range. As discussed earlier, there is no simple distinction between North American and European (Australian) companies that would warrant such an approach.

### 5.3.2 Effect of cash calls and regulatory reviews

It is possible that cash calls and the review of price controls do affect beta. However, that does not necessarily imply that these events create *distortions* that need to be corrected. Cash calls and price controls are events that can occur in the normal course of business for regulated companies, just as the announcements about dividends, or earnings, or changes of senior executives, can arise as a normal part of business and are usually reflected in stock prices. It is not common practice to control explicitly for earnings or dividend announcements because these are accepted as normal events for companies. Such events contrast with stock splits, for instance, which can create genuine distortions to stock prices and, therefore, to betas.

In general, unless it can be shown that cash calls or price reviews have led to a very sudden and substantial shift in the share price, which is unlikely to be repeated, we would not recommend trying to remove these effects.

Furthermore, the reason that *samples* of companies are used to estimate betas is to even out the effect small idiosyncratic events. Unless a really material effect has been uncovered, we would leave it to the power of averaging to smooth out the effects that Nera identify.

### 5.3.3 Filtering for illiquidity

We agree that it is important to filter out of the comparator sample any companies that are thinly traded. Thin trading can arise due to market imperfections and transaction costs. When illiquidity arises for such reasons, measured betas will be artificially depressed: when the market moves, the stock fails to move not because the stock has a low underlying exposure to systematic risk, but because market imperfections prevent investors from trading on the new information.

## Beta estimation

Nera is of the view that the illiquidity threshold applied by EK — i.e. companies with non-zero trading volumes on 90% or more of trading days within the estimation period — is not stringent enough on the basis that none of the companies are excluded as a result of applying the filter. That, in and of itself, is not proof that the threshold is inappropriate.

However, that is not to say that 90% is an absolutely correct number either; that level is a matter of judgment rather than a scientifically motivated threshold. As such, it may be worth conducting some sensitivity analysis by applying a stricter threshold, say 95%, to see how many companies, if any, are excluded as a result. Given that thin trading tends to bias betas down rather than up, it may be appropriate for EK to err on the side of caution by applying a stricter filter.

It is also worth noting that there is no single, universally accepted measure of stock illiquidity. Another metric (i.e. apart from the trading days with non-zero volumes) is the stock's bid-ask-spread (expressed as a percentage). It may be worth evaluating the liquidity of each of the comparators using their bid-ask-spreads as a cross-check on the results of the filter described above. In implementing this check, a judgment has to be made on the appropriate value bid-ask-spread threshold to apply. Again, there is no universally accepted number. Based on evidence from analysis we have undertaken in similar samples a 1% to 1.5% threshold is reasonable.

Finally, it is worth noting that thin trading tends to be less problematic when working with weekly rather than daily data. The reason is because for many quoted companies new information is likely to be incorporated into the stock price within a week. However, as the next section discusses, there can be drawbacks associated with using weekly returns data.

#### 5.3.4 Data frequency

EK uses both daily and weekly returns data to estimate betas. In practice, it is common to see beta estimates based on daily, weekly or monthly data. In our view, of these three choices, use of daily data is the most preferable. There are two main reasons for this:

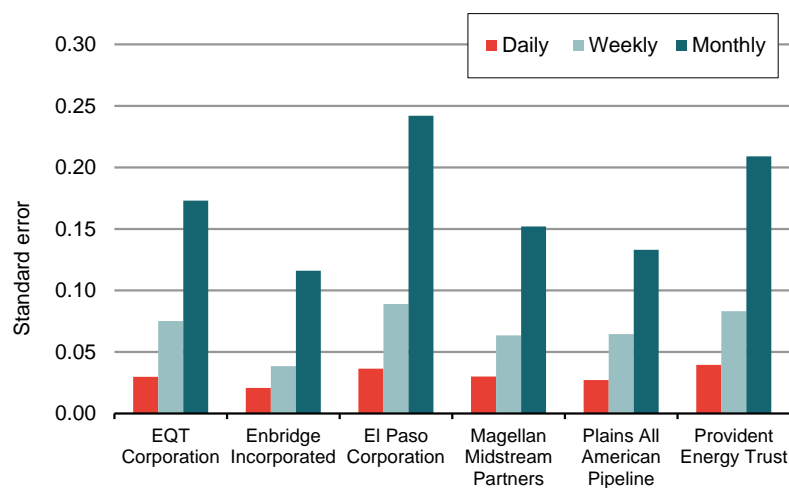
Firstly, it is uncontroversial that, for a given estimation period, beta estimates using daily data tend to be more statistically precise than betas measured using weekly or monthly returns data.<sup>4</sup> The statistical precision of an estimate is measured by its standard error; the lower the standard error, the more precise is the estimate.

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<sup>4</sup> See, for instance, Wright, S., Mason, R., Miles, D. (2003), "A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.", a Smith & Co. Ltd. report to the OFT and U.K. economic regulators, chapter 4.

**Figure 3** plots the standard errors of the estimated betas for six energy network companies, where the betas for each company have been measure using daily, weekly and monthly returns. It is clear that the standard errors of the estimates increase dramatically as the frequency of the data is lowered. The reason is because, lowering the data frequency within any given estimation period reduces the number data points available for the estimation. For example, over a five year estimation window, daily returns data will provide on average 1,260 data points (assuming 252 trading days in the average year), whereas weekly data will provide only 260 data points. The fewer the data points in the sample, the less precise will be the resulting estimates.

**Figure 3.** Frequency of returns data and statistical precision of beta estimates



Source: Frontier Economics

Notes: Five year estimation period used covering the years 2006 to 2011.

Secondly, when estimating betas using weekly returns, it is necessary to choose the reference day used to calculate returns (e.g. Monday to Monday, Tuesday to Tuesday, etc.). Empirically, it can make a significant difference which reference day is used. The risk of estimation bias due to choice of reference day is known as **reference day risk**. Acker and Duck (2007), who investigated the extent of reference day risk associated with five-year betas for S&P500 companies, show that the effect of reference day risk can be very severe.<sup>5</sup> For example, they found that:

<sup>5</sup> Acker, D. and Duck N.W. (2007), Reference-Day Risk and the Use of Monthly Returns Data, *Journal of Accounting, Auditing and Finance*, Fall 2007, Vol. 22 Issue 4, 527-557

- the beta of one stock was +2 using one reference day and -2 using another; and
- between two consecutive five-year periods, the beta of one stock *fell* by 0.93 using one reference day and *rose* by 3.5 using another.

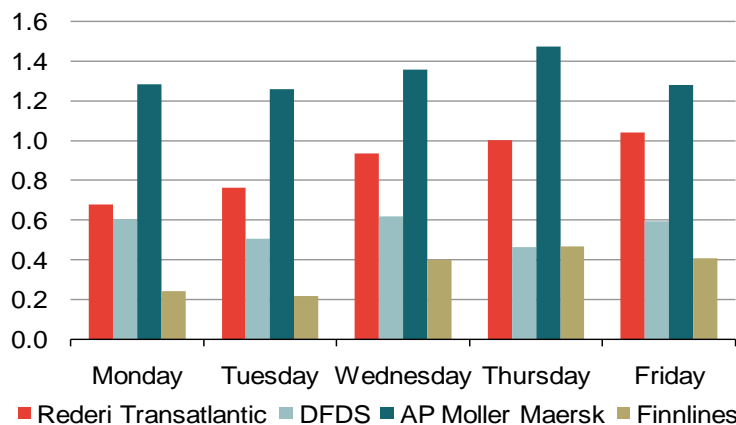
**Figure 4** demonstrates, for a group of maritime companies, that the estimated beta can vary considerably depending on which day of the week is selected as the reference day.

When working with daily returns data, there is no need to make a judgment on the appropriate reference day.

One solution to the reference risk problem that is sometimes applied is to obtain a weekly beta estimate by averaging across the Monday, Tuesday, Wednesday, Thursday and Friday betas. This average weekly beta will be less volatile and generally provide a better approximation to the estimated daily betas over the same period. This is the approach that EK has adopted in this analysis.

Even so, in order to estimate all five of the weekday betas, it is necessary to obtain daily share price data in any case. Given this, it is less onerous to simply estimate daily betas than calculate five separate weekday betas and then average across these.

**Figure 4.** Effect of reference day risk on beta estimates using weekly returns data



Source: Frontier Economics

There can be some limitations with working with daily data. Firstly, there is a greater risk of beta estimates being biased by thin trading of stocks. However, if the comparator selection process appropriately filters out thinly traded stocks, this problem should not arise. Secondly, daily data can give rise to statistical problems such as serial correlation. This issue is discussed in the next section.

### 5.3.5 Statistical issues and choice of estimator

Two statistical problems that can arise when econometrically estimating betas are:

- **Serial correlation**, which occurs when data points (e.g. stock returns) are correlated over time.<sup>6</sup> Serial correlation is more likely to occur with daily returns data than weekly returns data.
- **Heteroscedasticity**, which occurs when the variance of the error term used to estimate betas is non-constant (i.e. changes with stock returns).

Neither of these problems will lead to biased beta estimates. However, the presence of either of these problems would bias the standard errors associated with the estimated betas.

It would be important to ensure that the standard errors of the estimator are unbiased if constructing statistical confidence intervals around point estimates of beta (which EK currently does not do). Even more importantly in this particular case, it is important to ensure that the standard errors are unbiased because EK applies a Vasicek adjustment to the estimated equity betas. The standard error of the estimated beta is an important input into this calculation.

EK has undertaken a number of statistical tests to check for evidence of serial correlation and heteroscedasticity. These tests detect heteroscedasticity in about half the companies in the sample, and serial correlation in approximately a quarter of the comparators. Dropping the affected betas from the sample appears to have little impact on the overall estimated betas.

We would advise that, rather than dropping the affected betas, EK adopt an estimation technique that produces standard errors that are robust to serial correlation and heteroscedasticity. Such techniques (e.g. the Newey-West estimator) are standard features of conventional statistical packages and are straightforward to implement.

Given the way these correction techniques are applied, we would expect the estimated equity betas to move slightly closer to the prior than is currently the case. In the overall context of the issues that influence the estimate of beta, we consider this to be a second order issue. As such, we would suggest that the adoption of these techniques be considered as part of a wider review of the methodology in future.

### 5.3.6 Use of Vasicek betas

In general, we have no objection to the use of the Vasicek adjustment, subject to the comments we make below.

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<sup>6</sup> Specifically, the disturbance terms relating to observations over time are correlated.

Nera implies in its critique of EK's analysis that the Vasicek adjustment suffers from subjectivity that the Blume adjustment method is free from. This is an unfair criticism. It is true that the Vasicek method requires judgments to be made on one's prior beliefs about the true beta value. However, it is quite common for practitioners to take the average market beta of one (i.e. EK's approach) or the average industry beta to be a suitable prior estimate.

Moreover, it is inaccurate to cast the Blume adjustment as free from subjectivity. The Blume method mechanically moves all betas towards a value of one by attaching a two-thirds weight to the company's estimated beta, and a one-third weight to the known market beta of one.<sup>7</sup> Arguably, these rule-of-thumb weights are just as subjective as the choice of prior when applying the Vasicek adjustment.

When applying the Vasicek adjustment, there is a potential inconsistency in EK's treatment of the prior. In order to implement the Vasicek adjustment, four pieces of information are required:

1. the company's estimated equity beta;
2. the standard error of the company's estimated equity beta;
3. the prior value of the equity beta; and
4. the variance of the prior.

The first two of these are straightforward to obtain; these are standard outputs from a regression of company returns on market returns. The last two elements require some judgment.

As discussed earlier, the prior beta is often taken to be the beta of the market portfolio, and therefore has a beta of one. This is the assumption that EK makes. A consistent treatment of the prior would then use the cross-sectional variance of all betas in the market portfolio (or the relevant market index, which is viewed as a proxy for the market portfolio) as the variance of the prior.<sup>8</sup>

This is generally a very data-intensive calculation to make as it requires a beta estimate for every company listed on the relevant stock exchange (in order to calculate the cross-sectional variance of these). So, for example, application of the Vasicek adjustment for a single UK company would require one to have beta estimates for all 630 or so companies reflected within the FTSE All Share index. Similarly, applying the Vasicek adjustment for a single US company would

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<sup>7</sup> An advantage of the Vasicek approach is that company estimates are only moved significantly towards the prior if they are statistically imprecise in the sense of having large standard errors.

<sup>8</sup> Vasicek, O. A. (1973), A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas, *Journal of Finance* 28(5), 1233-1239.

require one to have a beta estimate for each company captured within, for example, the S&P500 index.

Therefore, some practitioners do as EK has done and take, as a measure of the variance of the prior, the cross-sectional variance of the estimated betas within the comparator group. This gives rise to a conceptual mis-match in the sense that the cross-sectional distribution of the prior is built up using the mean of the whole market and the cross-sectional variance of sample (industry) betas.

An alternative, and arguably more consistent, treatment of the prior proposed by Vasicek (1973, p.1237) would be to build up the cross-sectional distribution of the prior using past measurements of the industry beta. Adapting the example used by Vasicek to this particular case, if the estimated comparator betas in the *previous control period* had an average value of 0.8, and a dispersion of 0.3, then the prior beta in the *current period* could be taken to be 0.8, and the variance of the prior taken to be  $0.3^2 = 0.09$ .

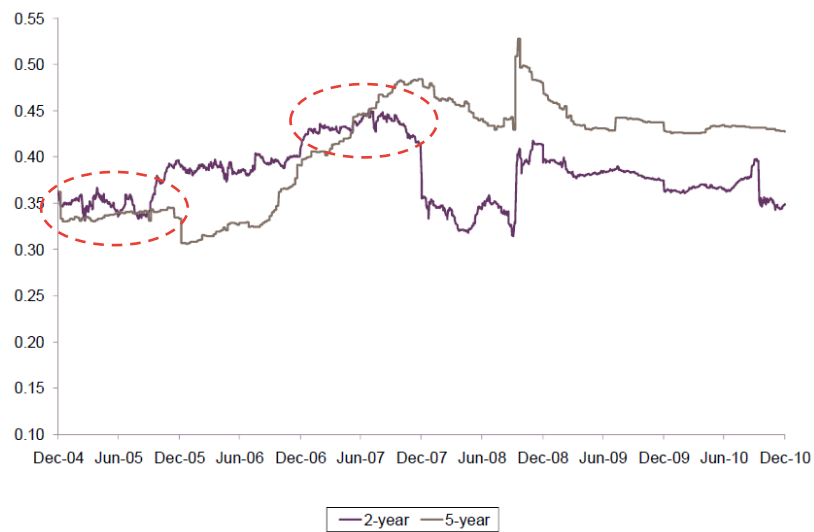
### 5.3.7 Modigliani-Miller levering/de-levering formula

We are aware that there are a dozen or so different levering/de-levering formulae, of which the Modigliani-Miller (MM) formula is just one. The MM formula is used by a large number of practitioners and academics and we have no objection to its use in the present context.

### 5.3.8 Defining the upper and lower bounds of the asset beta range

EK defines its asset beta range as the difference between the median (across peers) two-year daily asset beta and the median five-year weekly asset beta. We would not recommend this approach.

The purpose of defining a range for a given parameter value is to reflect the uncertainty underlying the estimates, i.e. the estimation error. **Figure 5** below reproduces Oxera's plot of rolling median two-year daily and five-year weekly beta estimates for the comparators.

**Figure 5.** Rolling median beta estimates of comparators

Source: Primary chart from Oxera

It is evident from the chart that there were at least two periods since December 2004 when the estimates using different data frequency converged very closely. Mechanically taking the beta range to be the difference between two-year daily and five-year weekly estimates would imply that the uncertainty over the true value of beta during these periods of convergence was virtually zero. This cannot be correct because there would still be estimation error attached to both the two-year daily and five-year weekly estimates.

A more conceptually attractive approach would be to define the beta range as the interquartile range of the daily beta estimates. (We have explained in an earlier section why we believe daily betas are preferable to weekly betas.)

Overall, the approach adopted by EK results in an appropriate estimate of the beta, specifically in terms of the mid-point of the beta range.



## 6 Gearing and debt premium

### 6.1 EK approach to gearing and debt premium

#### 6.1.1 Gearing

EK used a notional measure of gearing in its determination. In determining a notional gearing range for the GTS, EK considered two questions:

1. What is the appropriate target credit rating?
2. What gearing assumption is consistent with this target credit rating?

In answering the first question, EK looked at a range of evidence, including:

- credit ratings of comparator companies;
- market data on issuance volumes and costs;
- regulatory precedents;
- the credit rating of GTS's parent company; and
- legal requirements on energy networks in The Netherlands to maintain a certain credit rating.

EK concluded that a target credit rating of A/BBB was appropriate for the period 2006 to 2008, and the low end of the A range from 2009 onwards. EK justifies this conclusion on the basis that:

- it is consistent with the tendency for regulators to raise the target credit rating of network businesses from BBB+ towards A- following the credit crisis; and
- the higher costs to businesses (through larger bond spreads) associated with a downgrade to BBB during and after the financial crisis.

On the second question above, EK looked at the following evidence:

- observed (book and market) gearing for rated companies;
- regulatory precedents for notional gearing; and
- Debt/RAB ratios.

On the basis of this evidence, EK concluded that a gearing range of 50% to 60% was appropriate.

#### 6.1.2 Debt premium

In determining the debt premium, EK has followed the approach it took in previous determinations. It used data on the spread implied by the five-year

average spread on general European corporate bond indexes, and the two-year average spread on a sample of reference bonds issued by comparator companies.

The spreads on the bonds within the general index appear to have been calculated by taking the composite yield implied by the index and subtracting the yields implied by a European sovereign debt index.

The reference bonds considered were all traded securities with a time to maturity of approximately 10 years, issued by A-rated energy networks.

In addition, EK allowed a 10-20bp mark-up on the debt premium to reflect debt issuance fees and debt-related overheads.

## 6.2 Stakeholder comments

### 6.2.1 Gearing

Nera's most substantive comment on EK's approach to gearing is that a notional range of 50% to 60% over the whole period under consideration (2006 onwards) is inconsistent with the assumption of a higher target rating during the financial crisis.

### 6.2.2 Debt premium

Nera argued that EK's assumption of a shift in target credit rating of BBB/A in 2006-2008 to A ratings from 2009 onwards is implausible as a financing strategy. Nera therefore believes it is likely to lead to an underestimate of debt costs.

## 6.3 Assessment

### 6.3.1 Gearing

The argument that Nera make in their paper is that there appears to be an inconsistency in applying a the same gearing range for the period from 2006, while at the same time assuming a higher target credit rating during the credit crisis.

Other things being equal it may appear odd that a higher credit rating should be attached to the same level of gearing during a period of financial market turbulence. However, it is important to recognise that gearing is only one factor that that rating agencies consider when assessing the creditworthiness of a business.

**Figure 6** below shows a figure taken from Moody's Rating Methodology for regulated energy networks. It shows that there are a range of different factors that are taken into account in determining the credit rating. Net debt as a % of

### Gearing and debt premium

the regulated asset base is just one of these factors. In the Moody's methodology it is given a weighting of 15%.

**Figure 6.** Factors affecting credit rating

Rating Factor/Sub-Factor Weighting			
Broad Rating Factors	Broad Rating Factor Weighting	Rating Sub-Factor	Sub-Factor Weighting
Regulatory Environment and Asset Ownership Model	40%	Stability and Predictability of Regulatory Regime	15.00%
		Asset Ownership Model	10.00%
		Cost and Investment Recovery	10.00%
		Revenue Risk	5.00%
Efficiency and Execution Risk	10%	Cost Efficiency	6.00%
		Scale and Complexity of Capital Programme	4.00%
Stability of Business Model and Financial Structure	10%	Ability and Willingness to Pursue Opportunistic Corporate Activity	3.33%
		Ability and Willingness to Increase Leverage	3.33%
		Targeted Proportion of Operating Profit Outside Core Regulated Activities	3.33%
Key Credit Metrics	40%	Adjusted ICR (or FFO Interest Cover)	15.00%
		Net Debt/RAV (or Fixed Assets)	15.00%
		FFO/Net Debt	5.00%
		RCF/Capex	5.00%
<b>Total</b>	<b>100%</b>		<b>100.0%</b>

Source: Moodys Global Infrastructure Finance, Ratings Methodology, August 2009

As a result, it is perfectly possible that a utility's credit rating can change over time even though its capital structure remains constant.

We have reviewed the gearing assumptions made by a number of European regulators. There is variation between regulators in terms of the gearing assumption, which ranges between 40% and 70%. Nevertheless the majority of the regulators' decisions lie around 60%.

Overall, given the evidence available, including the gearing levels of comparators and the gearing levels assumed by regulators for similar businesses, we consider that a notional gearing range for GTS of 50% to 60% is appropriate.

### 6.3.2 Debt premium

We have two substantive comments on the methodology used to determine the debt premium.

- Firstly, we are comfortable with EK's use of different sources of evidence — i.e. spreads from a general corporate bond index, and spreads from industry-specific reference bonds — to estimate the debt premium. However, it is unclear to us why two different averaging periods should be

applied to the different data. Using a five year averaging period for the general bond index and a two year averaging period for the energy sector bonds seems a somewhat arbitrary choice. A two year, or five year, averaging period applied to both sources of data may be just as valid.

Sometimes the averaging period applied to different data may reflect the quality or availability of data. If this is the case, it would be helpful for this to be more clearly explained.

- Secondly, we are concerned about EK's use of a general European sovereign bond index to calculate the spread implied by the general corporate bond index. It would be conceptually better to calculate these spreads using the yields on Dutch government bond yields, given that the debt premium will ultimately be applied to a risk-free rate that has been determined using Dutch government bond rates.

In addition, we note that if the European sovereign bond index is a representative basket of debt instruments issued by Eurozone governments, the index will be influenced by the yields on Portuguese, Irish, Greek and Spanish government bonds. Given the current Eurozone debt crisis, the yields on these bonds can hardly be considered good benchmarks for the riskless rate. In contrast, the Netherlands currently has a AAA sovereign debt rating.

Furthermore, we would expect the European general corporate bond index to be more heavily weighted towards debt instruments issued by companies in Northern Europe, since that is where the bulk of economic activity in the Eurozone tends to occur. This is another reason why applying a Eurozone sovereign bond index to a general European corporate bond index could amount to a mismatch.

## 7 Inflation and tax

### 7.1 EK approach to inflation and tax

The methodology for estimating the real WACC involves the following inflation adjustment.

- The inflation adjustment is applied to the estimate of the nominal WACC to calculate the real WACC. This is done using the Fisher formula.
- The inflation adjustment is based on combination of actual and forecast inflation. Specifically, the range for inflation is arrived at by estimating two values:
  - one based on 2 years actual inflation and a one year forecast; and
  - one based on a 5 years actual inflation and one year forecast.

In terms of corporate tax, to calculate the pre-tax WACC EK use the standard corporate tax rate. For most of the years in question this is 25.5% (29.1% in 2006 and 25.0% in 2011).

### 7.2 Stakeholder comments

In its report for GTS, Nera argue that the projection for inflation should match the horizon for the estimate of the risk-free rate. In other words, that the inflation rate to apply to the nominal 10 year risk-free rate over the past two years should be the 10 year inflation forecast, also over the past two years.

There were no other comments on the inflation rate and no comments on the use of the standard corporate tax rate.

### 7.3 Assessment

The comment made by Nera, that the inflation projection should match the maturity of the bond used to estimate the nominal risk-free rate, is conceptually correct. This was also recognised by Oxera in its report to EK:

*“In essence, the revised methodology was anchored on the principle that the inflation adjustment in the WACC calculation should seek to capture the inflation expectations that investors had incorporated in the price of securities that were used to estimate the components of the WACC.” (p36)*

There are a variety of sources of evidence to inform this:

- 10 year inflation forecasts from independent forecasters (i.e. those collected by Consensus Economics;

- medium-term inflation forecasts (i.e. 3 – 4 years) from the Netherlands Bureau for Economic Policy Analysis (CPB);
- inflation expectations for other European countries based on index-linked government bonds;
- recent actual inflation rates in the Netherlands; and
- published medium-term inflation targets (i.e. from the European Central Bank).

In our view there is no case to rely on a single source of evidence. 10 year inflation forecasts are conceptually correct but the quality of forecasts may be variable and hard to ascertain. There could be a risk in solely relying on this source of evidence.

At the same time the methodology set out in the Oxera paper, which focuses largely on recent historic out-turns, does not appear to be satisfactory. The fact that the results for this were checked against longer-term forecasts provides reassurance that the estimates were reasonable. However, in other circumstances the methodology may not match with the other evidence, including the forecast data. We would recommend an approach to the inflation projection that takes account of the wider evidence, starting with the longer term inflation projections that are available.

The approach to corporate tax is suitable and is consistent with standard regulatory practice.

## 8 Overall assessment

### 8.1 WACC estimate

#### 8.1.1 Estimating the low and high range

The methodology adopted by EK involves estimating a range for the overall WACC based on the ranges for the individual parameters as described above. In most cases the low range for the WACC is estimated from the low value for each parameter and the high range from the high value. The exception is for gearing, where the low range corresponds to the high gearing assumption.

This particular treatment of gearing has no material impact on the estimate of the overall WACC. In either case the mid-point for the WACC is 6.5%. None of the stakeholders commented on this approach.

On balance, though, we consider that it would be more consistent to keep the low gearing assumption with the low range for the WACC. By doing this the lower gearing value is linked to the low range for the debt premium. This would appear to be more consistent.

#### 8.1.2 Differential factors

In its submission to EK, GTS referred to factors which, in its view, mean that the WACC should be set at a higher level and potentially towards the top of the estimated range.

Specific factors that were referred are:

- GTS is subject to a degree of volume risk that is not shared by other energy networks; and
- there is a risk of stranded assets, particularly for investment in capacity for gas transit across borders.

In relation to the second factor it is important to consider the risk in the context of the regulatory framework. The concern raised by GTS is that the asset lives of these investments are greater than the length of the commercial contracts in place to support them. Therefore GTS is bearing the risk that the contracts will not be renewed and therefore that the investment will not be fully recovered.

Stranding asset risk can be a factor that affects the cost of capital. However in this case the risk is likely to be minimal because the investments are included in the regulator asset base (RAB). Even if the contracts were not renewed, GTS would be allowed to recover the remaining investment costs through the overall tariff methodology and the return on the RAB.

GTS is still exposed to the risk that the regulatory methodology could change in the future and the protection through the RAB may be amended. However, this is a risk that is borne by all regulated network industries in all the comparator countries to some degree. In order for GTS to argue that an adjustment is appropriate, it would need to show that the risk in the Netherlands is materially higher than the risks faced by peers within the sample.

With regard to the first factor, it is correct to say that exposure to volume changes is a risk factor and that this can feed through into a higher cost of capital. However, it is only one of the factors that determines the overall balance of risk for a regulated network. Other factors include:

- the length of the price control period;
- the degree of protection for investment offered through the RAB;
- assumptions regarding asset lives;
- degree of risk for operating costs (including pass-through of non-controllable costs and benchmarking of efficient costs);
- scale of new investment programmes and the regulatory treatment of new investment; and
- the predictability and transparency of the regulatory process.

We have not been asked to undertake a detailed comparison of these risk factors for GTS or the comparator firms. Nevertheless, we note that the comparator sample for the beta analysis is drawn from a number of different countries. Although these countries share many similarities, and are developed economies with mature legal and regulatory structures, there will be differences in the specific characteristics of the networks and the regulatory structures.

To show that GTS should lie towards the top of range in terms of risk, one would need to consider the whole range of factors. We do not consider that GTS has demonstrated that its risk profile is atypical relative to the comparator set.

## 8.2 General comment on methodology

In the preceding sections we have made a number of specific comments and recommendations about the methodologies used to estimate the WACC parameters.

A general comment we would make is that the methodology applied by EK appears to be quite prescriptive. The same (or very similar) estimation methodology is applied in each regulatory review.

## Overall assessment

Applying a predictable methodology in this way can have a number of advantages. It provides greater certainty for stakeholders and should, ideally, result in more efficient regulatory decision making.

The concern we have is that methodology also needs to be adaptable over time to reflect changing circumstances and data availability. A methodology that results in appropriate results at the point it was designed may not give appropriate results in all possible cases. The financial crisis in 2008 illustrates the large swings financial market parameters that are possible. Although we consider that EK's methodology was reasonably robust to the financial crisis, we cannot be certain that it would respond so well in all cases.

We do not want to imply that EK treat the methodology as fixed and we are aware that the application of it has evolved over time. Nevertheless we would recommend that EK maintains a process for reviewing and adapting the methodology over time.

### 8.3 Cross-check of EK WACC estimates using recent European regulatory decisions

EK has asked Frontier to provide a summary of recent relevant European regulatory determinations as a simple cross-check of the rates it has determined for GTS.

**Table 1** summarises the most recent pre-tax WACC determinations issued by regulators in Austria, France, Italy, Luxembourg, Spain, and the UK. Although the German regulator, BNetzA, does regulate gas networks, it does not follow a standard WACC approach in this process. It determines and applies the costs of equity and debt separately, outside a WACC framework. Therefore there are no decisions by BNetzA on the overall WACC for German networks. For ease of comparison, we also present the most recent WACC figures used by EK.

The main focus is on the determinations relating to gas transmission assets. However, for completeness we have also included figures for gas distribution networks.

Making comparisons across these European determinations is difficult for a number of reasons:

- some determinations are made in nominal and some in real terms;
- tax rates vary from country to country; and
- the determinations have been made at different points in time.

In the next section we make a number of adjustments to enable closer comparisons between the decisions to be made.

**Table 1.** Recent European regulatory WACC determinations for gas networks

Country	Transmission	Distribution	Sources
Austria	Not published	6.97% (2008-12)	E-Control, Erläuterungen zur Gas SNT-VO 2008
France	7.25% (2009)	6.75% (2008)	Tariff proposal from Commission de Régulation de l'Energie, 2 April 2009 for use of public natural gas distribution networks.  Deliberation of 16 July 2009 by the French Energy Regulatory Commission on the proposed tariff for the use of LNG terminals
Italy	6.40% (2010-2013)	7.60% (2010-2012)	Criteria per la determinazione delle tariffe per il servizio di trasporto e dispacciamento del gas naturale per il periodo di regolazione 2010-2013  Regolazione tariffaria dei servizi di distribuzione e misura del gas per il periodo di regolazione 2009-2012 (RTDG). Disposizioni transitorie per l'anno 2009
Luxembourg	8.50% (2009)	8.50% (2009)	Memorial, Journal Officiel du Grand-Duché de Luxembourg, 24 Avril 2009
Netherlands	6.50% (2009)  5.80% (2011-2013)	6.20% (2011-2013)	NMa regulatory decisions
Spain	8.11% (2008)	8.71% (2008)	CNE, Consulta pública para la revisión de la metodología de estimación del coste de capital para actividades reguladas en el sector energético: Resultados de la consulta y nueva propuesta, 13 December 2007
UK	6.29% (2007-2012)	5.97% (2008-2013)	Ofgem Transmission Price Control Review: Final Proposals, 2006  Ofgem Gas Distribution Price Control Review: Final Proposals, 2007

Source: Frontier Economics research

Notes: Values in **red** are expressed in real terms. All values are pre-tax amounts. Data on Spain were difficult to find. The figures for Spain were extracted from a 2008 consultation document issued by the regulator. This figure has not been applied by the regulator to date for the purposes of price setting.

## Overall assessment

### 8.3.1 Like-for-like comparisons of cost of capital estimates

In the table below we have aimed to make the determinations more comparable to the current determinations in the Netherlands. To do this we have applied a Dutch corporate tax rate of 25.5% to all decisions in **Table 1**.<sup>9</sup> We have also applied a consistent inflation assumption of 1.4% (EK used an inflation range of 1.3% to 1.5% for the period 2011 onwards) when converting between from real to nominal figures.

**Table 2.** Recent European regulatory WACC determinations for gas networks

Country	Transmission	Distribution
Austria	Not published	5.37% (2008-12)
France	6.51% (2009)	6.08% (2008)
Italy	6.05% (2010-2013)	6.65% (2010-2012)
Luxembourg	6.43% (2009)	6.43% (2009)
<b>Netherlands</b>	6.50% (2009) 5.80% (2011-2013)	6.20% (2011-2013)
Spain	6.12% (2008)	6.69% (2008)
UK	6.01% (2007-2012)	5.87% (2008-2013)

Source: Frontier Economics research

Notes: All values are expressed in real terms. All values are real pre-tax amounts and assume a Dutch corporate tax rate of 25.5% and an inflation rate of 1.4%. The figures for Spain are based on a 2008 consultation document issued by the regulator.

This comparison indicates that the 2009 Dutch gas transmission determination was above average across the European countries we have considered, though the difference is not large. The average across the adjusted figures for France,

<sup>9</sup> We note that effective from 1 January 2011 the corporate tax rate in the Netherlands (on taxable profits exceeding €200,000) was reduced from 25.5% to 25%. We have used the higher tax rate of 25.5% to allow better comparison with determinations made prior to 2011.

Italy, Luxembourg, Spain and UK is approximately 6.2%; c.f. the 2009 EK determination of 6.5%. In terms of timing, the 2009 EK determination is reasonably comparable the other European determinations considered.

The current gas transmission determination in the Netherlands is slightly below the average across the European countries we have considered. However, in making this comparison it is important to recognise that market conditions have changed since 2008 (EK's 2009 determination used data up to the end of 2008). For instance, in some cases the European determinations considered were made before 2008 when government bond yields in some countries were higher than they currently (e.g. Ofgem is proposing a lower overall WACC for transmission in the upcoming determination than is shown in the table). Therefore it should not be surprising that EK's most recent determination differs from its 2009 one (and the determinations of other, older European determinations), having taken new market data into account.

## Overall assessment

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