The Cost of Capital for DSOs

Review of VREG's Methodology

PREPARED FOR

VREG

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Introduction and Summary

Since July 1st 2014, the Flemish Regulator for Electricity and Gas (the *Vlaamse Regulator van de Elektriciteits- en Gasmarkt* or VREG) has been responsible for regulating the tariffs for gas and electricity distribution in Flanders. An important element of the tariffs is the allowed return on capital for the Distribution System Operators (DSOs). In common with most regulators, the VREG sets the allowed return equal to the estimated Weighted Average Cost of Capital (WACC) for the DSOs. Also in common with most, if not all, EU national regulatory Authorities (NRAs), VREG estimates the cost of equity using the Capital Asset Pricing Model (CAPM).

The first price control has duration of two years and spanned the period January 2015 to December 2016. The next price control will take effect from January 2017 for an as yet to be determined duration. The VREG is currently reviewing the WACC methodology that it applied for the first price control, to see if improvements can be made for the second price control. VREG has retained *The Brattle Group* to review the WACC methodology applied in the first price control, which for convenience in this report we refer to as the '2015 methodology', and to make suggestions for any improvements. VREG have also posed a series of specific questions for us to address in this report. We agree that the use of the CAPM to estimate the cost of equity is reasonable, and so do not investigate alternative methods for estimating the cost of equity in this report.

We discuss each element of the 2015 WACC calculation in turn, beginning by summarising the VREG's approach under the 2015 methodology and updating the estimate of each parameter using the 2015 methodology. We then comment on the reasonableness of the methodology and whether improvements could be made. We also address VREG's specific questions.

I.A. The Risk-Free Rate

We agree with VREG's use of 10-year bonds to estimate the risk-free rate. The maturity of the bonds is longer than the regulatory period, and so will contain some compensation for inflation risk that the DSOs do not bear. On the other hand, the use of long-term bonds in the CAPM will partially reflect the results of the 'Empirical' CAPM or ECAPM. The ECAPM indicates that actual returns are higher than predicted for low beta companies than the standard CAPM predicts. Hence, the use of the long-term bonds should result in a more accurate estimate of the cost of equity. The use of a long-term bond is also more consistent with the long-term data VREG uses for the ERP estimate.

VREG calculates the risk-free rate using the average of bond yields over a two year period. Taking average bond yields over a relatively long period of time involves a trade-off. On the one hand, the use of a long-term average 'smooths' the risk-free rate estimate, because it will change more gradually over time. This is advantageous in that the risk-free rate will not change significantly between, for example, the consultation period and the determination of the final WACC. However, the disadvantage is that it uses more 'out of date' historic yield data, which reduces the accuracy of the risk-free rate estimate for the upcoming regulatory period. We have investigated this trade off and recommend that VREG limit the averaging period to one year.

In the 2015 methodology VREG estimated the risk-free rate by taking the average of German and Belgian bond yields. Our concern is that the use of German bond yields could underestimate the required return for DSOs in Flanders, and in particular the compensation for regulatory risk. The difference between Belgian and German bond yields – the Belgian 'country spread' – is a good starting point for estimating the return required for regulatory risk. However, to the extent that Flemish risk differs from Belgian risk generally, VREG could reasonably reduce the country spread premium. .

The European Central Bank has begun a program of Quantitative Easing (QE), which is likely to persist throughout the regulatory period. Other regulators have recognised that QE programs depress bond yields and could lead to an underestimate of regulatory risk. To counter this effect, we recommend that VREG increase the estimate of the risk-free rate while the QE program is in place.

I.B. BETA

We find the VREG's methodology for estimating beta, which is based on a survey of other regulatory decisions, is reasonable. We have made an updated estimate of the DSO's asset beta of 0.43, which is significantly higher than VREG's previous estimate of 0.33. We cannot show that the new asset beta estimate is statistically significantly different from VREG's previous estimate. However, any errors in the beta estimate will be symmetric, so that the current beta estimate is likely to be the best point estimate. We also note that the new beta estimate would have to diverge very significantly from the old estimate to be sure that the true beta had changed. But this would then involve a large change in beta. Introducing large changes in the parameters of the WACC calculation is to be avoided if possible, because it increases regulatory risk. Given this, we recommend that VREG update its asset beta estimate regularly – so at every price control – rather than wait for a large adjustment to be required at some point in the future. However, given the uncertainty in the beta value, it would not be unreasonable for VREG to approach the beta update cautiously, by for example taking the

average of the previous and updated asset beta values in the next price control. We do not recommend setting a separate beta for electricity distribution and gas distribution.

I.C. Equity Risk Premium

We agree with VREG's methodology for estimating the ERP, which is essentially the same as the methodology we applied for the Dutch energy regulator in 2012 and in subsequent studies. We have updated the ERP estimate, and find it has only changed from 5.1% to 5.0%. In common with the Dutch energy regulator, VREG uses both geometric and arithmetic averages of excess returns in its ERP estimate. We do not see a compelling case for a change to VREG's current methodology.

I.D. Gearing

We note that the WACC is relatively insensitive to the choice of gearing in the WACC decision. However, because the interest on debt is tax deductible, the WACC will reduce as the level of debt increases, until the risk of bankruptcy becomes excessive. The regulator must choose a target level of gearing which allows consumers to benefit from a lower WACC due to the presence of a 'reasonable' amount of debt.

In the 2015 methodology, VREG calculated the WACC based on a notional gearing of 55%. This was very close to the average actual gearing levels of the DSOs. Since the last WACC estimate, Eandis's gearing – as calculated using the standard methodology of taking the ratio of net debt to RAB – has increased to about 78% in 2015. This is above the maximum gearing of 70% required for an 'A' credit rating according to Moody's. Note that the 70% upper limit is higher than the 60% limit VREG assumed in the 2015 methodology, because the Flemish DSOs enjoy implicit government support according to Moody's, and so can bear higher debt while maintaining an 'A' rating. If Eandis's planned partial privatisation is successful, we estimate its gearing could reduce to about 64%, though this is uncertain as we do not know what fraction of Eandis will be sold. Infrax's gearing is 56%. Calculated in an alternative, and in our view more realistic, way Eandis's gearing could reduce to 57% after the partial privatisation and Infrax's gearing would be 43%.

Given the implicit support assumed by the ratings agencies for DSOs in Flanders, an assumed gearing level of 60% would be comfortably within the A rating band. Hence a target gearing of 60% would allow Flemish consumers to benefit from a lower WACC – relative to a WACC based on lower levels of debt – without encouraging the DSOs to bear excessive credit risk.

I.E. Cost of Debt

VREG estimated the cost of debt based on a weighted average of 60% of the estimated cost of 'old' or existing debt and 40% of the new costs of debt that will be financed over the regulatory period. VREG's methodology recognises that in practice the DSO's have 'legacy debt' and will not finance all of their operations at the interest rates which apply at the beginning of the regulatory period. Given that there is currently a large difference between the interest costs on old and new debt and that DSOs should re-finance some of their debt over the regulatory period, we think VREG's approach is sensible. The alternative of using only the cost of new debt could cause financial problems for the DSOs, because their actual interest costs would be significantly higher than those assumed for the WACC. On the other hand, if VREG used a 'pure' embedded debt approach this would ignore that DSOs will refinance some of their debts at lower rates during the regulatory period, and they would be overcompensated for their debt costs. However, we recommend a check on the assumed 60/40 split of old and new debt, to ensure that this seems feasible.

We conclude that credit spreads based on generic A-rated utility yields provide a good proxy for the actual cost of the DSO's debt.

In the 2015 methodology, VREG allowed a 15 basis point increase in the cost of debt to allow for debt issuing costs. In our view, this uplift could distort the DSOs' borrowing decisions, and may not reflect actual issuing costs. We discuss an alternative way of dealing with issuing costs, where VREG grants a cash allowance for new debt issuing costs.

I.F. Taxes

The Belgian tax regime is unusual, in that a DSO's notional return on equity is partly tax deductible, and not all income from depreciation is tax deductible. We recommend that these taxes be 'passed through'. Given the tax regime in Belgium, trying to deal with taxes in the WACC would be complex and has no advantages that we can identify.

Calculating a regulatory notional tax allowance could encourage the DSOs to increase their debt, so as to reduce their actual taxes below the amount allowed for in the tariffs. However, we think this effect will be limited, both because the notional return on equity is also partly tax deductible, and because Eandis in particular has very limited cope to increase borrowing. However, to ensure that DSOs do not incur excessive debts, VREG could consider making the requirement for an 'A' credit rating mandatory, and impose financial sanctions on DSOs that fail to maintain an 'A' rating. In our opinion the introduction of taxes does not create any issues for estimating beta.

I.G. Other Issues

VREG have asked us to comment on a number of other issues, including whether the WACC should be adjusted to account for an 'illiquidity premium'. That is, if the DSOs are relatively small and not listed, they might have to discount their assets to achieve a sale. In our view an illiquidity premium is not required. This is because:

1) The claimed grounds for the illiquidity premium seem to largely double count regulatory risk, for which the DSO's are already compensated through the use of a Belgian government bond to calculate the risk-free rate;

2) Recent transactions involving Eandis's assets have not indicated that there was any discount given for illiquidity, and indeed a significant premium to the RAB was paid.

VREG has also asked us to comment on their approach to working capital. We agree that VREG's current method of estimating a reasonable amount of working capital – based on an analysis of the DSO's 'cash cycle' – is reasonable. However, we recommend that VREG allows a return on the DSO's working capital equal to the WACC, rather than only allowing the lower cost of debt which is the current approach.

The DSO's have accumulated a tariff deficit, which among others relates to their legal obligation to buy green certificates as well as an earlier 'freezing' of the tariff levels. DSOs are currently allowed to earn a return on the tariff deficit at the statutory rate, which is based on EURIBOR plus two percentage points. In our view, it would be more appropriate to allow a return derived from Belgian government bonds. This is because the tariff deficit is ultimately guaranteed by the Belgian state, and so the use of Belgian bonds would best compensate the DSO's for the credit risk that they bear by holding the tariff deficit. We estimate that, historically, the use of the statutory rate would have over-compensated the DSOs for the risk of the tariff deficit. The experience of Spain confirms that markets view the risks of tariff deficits guaranteed by regulators as being similar to the risks of government borrowing. However, to avoid any financing difficulties, VREG could transition to the new, lower, rate gradually.

VREG have also asked us to comment on whether the WACC needs to be reviewed during the regulatory period, and if so how. We describe a system whereby VREG could commit to review the risk-free rate and credit spreads if, during the regulatory period, the risk-free rate departs from the level in the WACC decision by more than a given amount. VREG would commit to then review the risk-free rate and credit spread in the allowed WACC. VREG would commit not to change any other element of the WACC.

II. The Risk-Free Rate

II.A. The 2015 Methodology

The 2015 methodology calculated the risk-free rate based on the average yield of Belgian and German government bonds. Specifically, VREG calculated the average yield on 10-year bonds over a two-year period, being June 2012 to June 2014, based on data from the central banks of Belgium and Germany.

We have updated the calculation of the risk-free rate, based on the 2015 methodology. We find that the average German bond yield is 0.98%, while the average Belgian bond yield is 1.40%. This gives an updated risk-free rate of 1.19%.

II.B. Comments on the Risk-Free Rate Methodology

II.B.1. Use of Long-term bonds

We agree with the VREG's use of a 10-year bond to calculate the risk-free rate. In our 2012 report for the ACM, we noted that using longer-dated bonds, such as a 10-year bond, had several advantages relative to short-term bonds.[1]

Using a longer term bond, which has a higher yield than a shorter-term bond, will result in a version of the CAPM that looks more like the Empirical CAPM or ECAPM model. The ECAPM is a modified version of the CAPM, which reflects the empirical observation that the relationship between company-specific returns and the market – the Securities Market Line or SML –is not as steep as indicated by the theoretical CAPM. The CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted. In other words, the SML is 'flatter' than predicted by the standard CAPM.[2]

The Empirical Capital Asset Pricing Model, or "ECAPM" attempts to correct for this defect in the CAPM. The ECAPM estimates the cost of capital according to equation 1 below.

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[1] Calculating the Equity Risk Premium and the Risk-free Rate, The Brattle Group, (Dan Harris, Bente Villadsen, Francesco Lo Passo), 26 November 2012, Prepared for the NMa and OPTA, which subsequently merged to form the ACM. See section 3.6.

[2] See for example E.F. Fama and K.R. French, "Industry Costs of Equity" *Journal of Financial Economics* 43, 1997, pp. 153-193.

Equation 1: ECAPM

$$r_E = r_f + \alpha + \beta_E \times (MRP - \alpha)$$

Where:

- r_f is the Risk-free Rate,
- α is an estimated parameter between 0 and 1,
- β_E is the Equity Beta,
- MRP is the Market Risk Premium.

Using a long-term bond has a similar effect as using the ECAPM. Because investors demand a higher yield on the long-term bond, the long-term bond raises the intercept with the vertical axis relative to the use of a short-term bond. This is equivalent to adding an 'alpha' in Equation 1 above. Because the ERP over a long-term bond is lower than over a short-term bond, the slope of the line is flatter. This is equivalent to subtracting 'alpha' from the ERP in Equation 1. Hence, using a long-term bond approximates the effect of the ECAPM, which should result in a more accurate estimate of the cost of equity.[3]

A second advantage of using a long-term bond is consistency with the data on the Equity Risk Premium (ERP). As a practical matter, DMS, which is the most commonly used source of the historical, outturn ERP, has measured the ERP with respect to either short-term (so roughly 6 month) bills, or long-term bonds, so roughly 20-years. Considering the need for consistency, this means that if we choose to estimate the ERP based on the historical DMS data (an issue we discuss in section IV), then we need to use either a short-term bill, or a relatively long-term bond. Historically, the yield curve for Belgium has been relatively flat from 10-year bonds onward, so that a 10-year bond is a reasonable approximation of a long-term bond. Accordingly, consistency with the available ERP estimates means that we should either use a forecast of the short-term, 3-6 month rate, or a 10-year bond.[4]

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[3] However, the use of a long-term bond will not provide as much as a flattening of the slope as would result from the application of the actual ECAPM.

[4] However, to the extent that there is a difference in yields on 10-year bonds and longer dated bonds, and if DMS data relies on bonds with maturities longer than 10 years, then the use of a 10-year bond will still tend to underestimate the cost of equity. This is because the historical ERP would

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Long-term bonds also tend to be more liquid, and so the observed yields will be a more reliable indicator of the actual market interest rate at any point in time.

The main potential criticism of using a 10-year bond is that, because it extends beyond the regulatory period,[5] the yield will reward DSOs for inflation and default risk that they do not bear. However, in our view, for the reasons set out above, when combined with the lower ERP over bonds the use of a 10-year bond to estimate the risk-free rate will approximate the results of the ECAPM, and so will not provide an excessive return for DSOs.

II.B.2. Averaging Period

VREG calculates the risk-free rate by taking the average yield over a two year period. Many other regulators also take the average yield over a period of one or more years.

From a policy perspective in our view the use of longer-term averaging seems defendable. Relying on the yield on only a single day to set the risk-free rate would introduce an element of 'randomness' and volatility into the WACC decision. This is because it is perfectly possible that the yield could be 20 basis points higher a week later, so that the exact timing of the WACC decision could strongly influence the risk-free rate and hence the WACC. Most NRAs consult on a draft WACC decision at least several months before the WACC will come into effect, so as to give time for market participants to comment and the NRA time to respond to the comments. If the NRA used a spot rate to estimate the risk-free rate, the WACC could change quite significantly between the consultation and the final decision. This would undermine the usefulness and validity of the consultation prices. Using a longer-term average yield 'smooths' changes in the yields, and make the WACC less dependent on timing issues. It means that changes in the WACC are easier to predict, which is desirable from the perspective of minimising regulatory risk.

If the risk-free rate is also the basis of the cost of debt calculation, then using a longer-term averages is a way of implicitly dealing with the cost of 'embedded debt'. That is, much of the network firms' debt will be fixed at interest rates set several years ago at least. Using longer

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generally be a higher when measured relative to a 10-year bond relative to a bond with a 20 or 30 year maturity.

[5] The regulatory period is not yet fixed, but it will likely be 3-4 years, rather than 10-years.

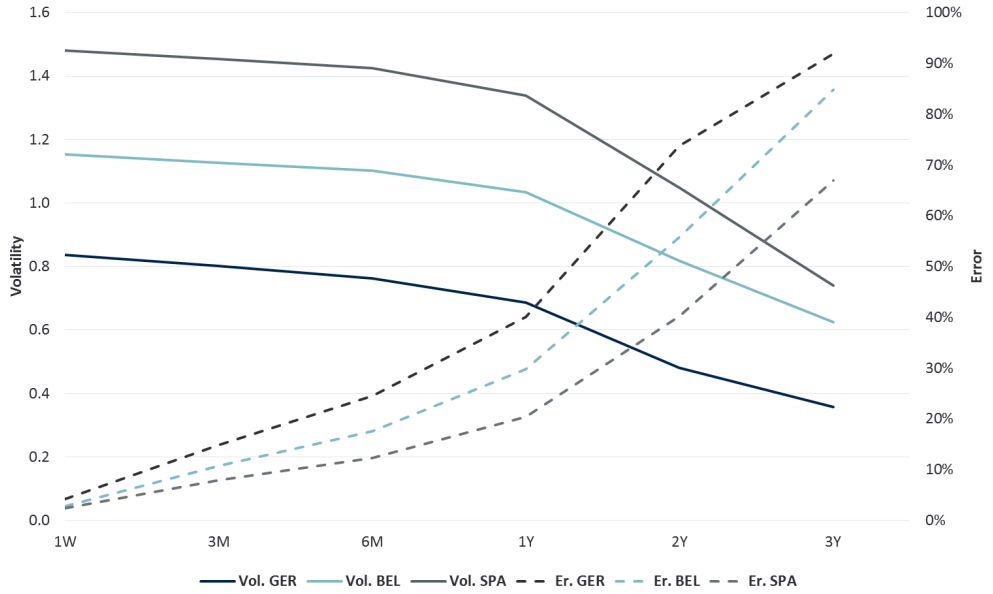
term average for the risk-free rate will partly capture the effect of the older interest rates that the networks might actually be paying on their debt.

However, the use of longer term average yields risks using out-of-date information. For example, in 2010 the use of a two-year average yield would have picked up high pre-crisis interest rates from 2008, even though it was very clear in 2010 that these rates were unlikely to re-occur within the regulatory period. Hence, there is a trade-off. Use of 'spot' rates would result in volatile WACC values which are hard to predict, while using 'excessive' averaging periods risks including too much information that is out of date.

In Figure 1 we investigate this trade-off in more detail. We have calculated an average yield on 10-year government bonds on a daily basis for the period January 2010 to October 2015. This is our estimate of the 'risk-free rate'. We calculate these averages for a series of different averaging periods – being one week, three months, six months, 1 year, two years and three years. We then take the standard deviation of the series of risk-free rate estimates – this is the measure of volatility. We do the calculation for three different government bonds, being Germany, Belgium and Spain. Figure 1 illustrates that, as expected, as the averaging period increases, the volatility reduces. With a long averaging period, the estimate of the risk-free rate will change very little from one day to the next, and so the volatility of the estimates will be low. This is the 'smoothing' effect from using a longer averaging period. From a regulatory policy perspective, this is desirable, because the risk-free rate will not be heavily dependent on the exact date of the WACC decision or when the analysis was carried out.

However, the longer the averaging period, the larger will be the difference with the current spot yield, which is arguably the best estimate of the risk-free rate over the regulatory period. In this example, we define the error as the absolute difference between the spot yield on the day and the risk-free rate calculated as an average yield over a given period. Figure 1 shows that as the averaging period increases, the average error also increases. For example, in Figure 1 an error (on the right-hand axis) of 50% means that, on average, the risk-free rate is 50% different from the best estimate of the future risk-free rate.

Figure 1: Error and volatility in risk-free rate as a function of the averaging period



Source: Brattle analysis of Bloomberg data.

Making the trade-off between stability and accuracy remains a matter of judgement. However, we note that VREG does not need to take a longer term average to deal with embedded debt as discussed above, because VREG deals with this issue explicitly (see section VI). Based on the above analysis, it seems that the error starts to increase at a greater rate when the averaging period exceeds one year. On the other hand, an averaging period of one year has already achieved a reasonable reduction in the volatility of the estimate. Hence, we would recommend a one year averaging period, rather than the two year period applied in the 2015 methodology.

II.B.3. Use of German Bonds

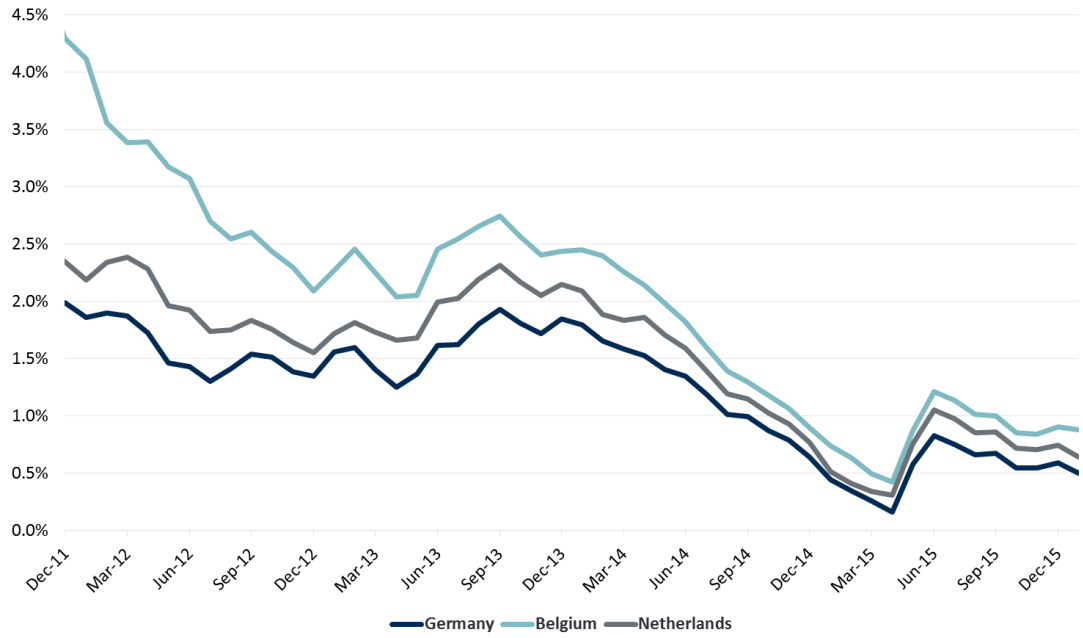
VREG calculates the risk-free rate by averaging the yield on Belgian and German bonds. In our 2012 report for the ACM, we noted that the best approximation for a true risk-free rate was the yield on German bonds. However, we also found that deriving the risk-free rate from the yields on the bonds for the country where the DSO was located - in this case Belgium – was reasonable. This is because the difference in yields between a Belgian bond and a German bond – the 'country spread' – reflects country risk. In general, country risk is closely related to regulatory risk. Hence adding the country risk premium to the WACC was, in general, a reasonable way to account for regulatory risk. That is, one can think of the WACC consisting of a true risk-free rate, being the German bond yield, and the regulatory risk premium, being the country spread.

However, there are two caveats to this conclusion. First, the DSOs should only be compensated for regulatory risk. They should not benefit from other elements of the country

spread that may relate to other factors, such as illiquidity. For example, in the case of the Netherlands we noted that some of the difference between Dutch and German bonds may be due to differences in the liquidity of the two bond issues. Investors will demand a slightly higher yield for holding less liquid bonds – the illiquidity premium. However, the illiquidity premium is not related to regulatory risk. In our 2013 report, the concern was that using only the yield on Dutch bonds could erroneously include the illiquidity premium in the WACC. To counter this risk, we suggested using the average of the Dutch and German bond yields.

We note that Dutch and German bond yields have in recent years been relatively close – Figure 2 illustrates. For example, the average difference in yields for the period January 2012 to December 2014 was 31.2 basis points. Moody's gives Dutch and German government bonds the same – and maximum – rating of Aaa.[6] It is difficult to measure the illiquidity premium, but it is likely to be in the order of perhaps 20-30 basis points. Hence, it is likely that the illiquidity premium makes up a significant part of the Dutch-German spread, in particular because both bonds have the same rating. For this reason, taking the average of the Dutch and German bonds is a reasonable way to correct for the presence of any illiquidity premium.

Figure 2: Monthly Average Yields on 10-year Dutch, German and Belgian bonds



Source: Brattle analysis of Bloomberg data. Bonds have matched maturity in 2025 Q3.

[6] Moody's Sovereign Outlook – Euro Area, March 17th, 2015.

However, as Figure 2 also illustrates, the yields on Belgian bonds have generally been higher than the yields on Dutch and German bonds, and at times yields have been significantly higher. This is reflected in a Moody's rating for Belgium which, at Aa3, is three 'notches' lower than the Dutch and German ratings.[7] The average spread between German and Belgian bonds over the period January 2012 to December 2014 was 87.9 basis points. Hence, in the case of Belgium, any illiquidity premium is likely to be only a relatively small part of the country spread.[8]

Second, the use of the Belgian country spread could overstate the compensation required for regulatory risk for two reasons. First, VREG is a regional regulator, guided by the Energy Decree of the Flemish government. This means that the spread on Belgian bonds may not reflect regulatory risk in Flanders. There is no traded debt of the Flemish regional government from which to try and measure the risk specific to Flanders. Second, as we discuss in section VIII.C, there is evidence that, to the extent that the power and independence of the regulator is highly trusted by markets, the country spread could overstate regulatory risk. For these reasons, it could be justified for VREG to reduce the country spread premium so that the cost of equity is calculated according to Equation 2 below.

Equation 2: ECAPM

$$r_E = r_{DE} + CRP_{BE} \times \phi + \beta_S \times MRP$$

Where:

- r_E is the return on equity;
- r_{DE} is the true risk-free rate measured as the yield on German bonds;
- CRP_{BE} is the country-risk premium for Belgium, measured as the difference in the spread between yields on Belgian and German bonds;

[7] Ibid.

[8] Ideally, we would like to try and measure the illiquidity premium for Belgian government bonds by comparing the spread between German and Belgian bonds yields (the Belgian country risk premium) to the Credit Default Swap (CDS) rate. This is because the CDS rate only reflects default risk, and does not reflect liquidity. A material difference between the Belgian country risk premium and the CDS rate would indicate a liquidity premium for Belgian bonds. However, no CDS rates are available for Belgian bonds at the time of writing.

- Φ is a value between 0 and 1, which reduces the country risk premium to reflect the lower risk for Flanders as compared to Belgian and the perceived independence of the Flemish regulator. Setting Φ equal to 0.5 would be mathematically equivalent to VREG's current approach of calculating the risk-free rate as the average of German and Belgian bond yields.

II.C. The Effects of Quantitative Easing

On January 22 2015 the European Central Bank (ECB) announced a Quantitative Easing (QE) program, in the form of an expanded asset purchase programme of bonds issued by euro area central government, agencies, and European institutions.[9] While originally anticipated to run until September 2016, the program will now run until at least March 2017.[10] The program, which started in March 2015, has temporarily increased the prices of government bonds directly involved, and hence reduced yields. This is similar to the effect of other ECB asset purchase programmes launched during the last four years.[11]

Programs of large assets purchases, such as the QE announced by the ECB, temporarily reduce bond-yields and hence the risk-free rate as measured by yields on 10-year government bonds. However, due to the forward looking nature of the WACC and the RFR, this does not mean that regulatory risk has reduced. Hence, there is a risk that estimating the risk-free rate from bond yields while a QE program is ongoing risks underestimating the return DSOs need to compensate for regulatory risk.

Accordingly, in our view adjustments to the Risk-free Rate, as estimated from bond yields, are justifiable when the regulatory period spans over the QE monetary policy timeframe and reflects a long-term view.

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[9] European Central Bank, "ECB announces expanded asset purchase program", Press Release 22 January 2015.

[10] Through the QE program the ECB intends to fulfil price stability and to address the risks of an extended period of low inflation. The foreseen asset purchase amounts to about € 60 billion per month.

[11] Namely, the other two relevant programmes of the ECB launched since the economic crisis to rescue the European countries from the negative effects of the economic downturn are: (i) the Securities Market Programme (SMP) launched in May 2010, which mainly implied asset purchase of Italy and Spain, and (ii) Outright Monetary Transactions (OMTs) started in September 2012, whit implications for short term government bills (1-3 years) of European countries most affected by the crisis.

Recent economic literature and regulatory decisions provide some benchmarks for QE-related adjustments to the risk-free rate:

- The Bank of England started a quantitative easing programme in March 2009 and continued purchasing government assets until October 2012, for a total amount of about £ 375 billion. The Bank of England estimates that its asset purchase program reduced UK Government bond yields by about 100 basis points.[12] Ofgem has recently decided to make an adjustment for the risk-free rate for about the same amount, pointing to evidence of the Bank of England's quantitative easing policy effects on yields and to provide consistency between the estimate of the risk-free rate and the equity risk premium;[13]

- The Federal Reserve launched a QE programme in November 2008 consisting in assets purchase for about $ 3.7 trillion until October 2014, whose effect has been empirically estimated to result in a yield reduction of about 100 basis points.[14]

- More recently, the European Central Bank (ECB) has published a paper about the effects of the QE program on European financial markets, distinguishing between "stocks" (or announcement), and "flow" (or portfolio rebalancing) effects.[15] Focusing on the first kind of effects, the authors measured that QE announcements by the ECB affected 10 year government bond yields between -16

[12] Bank of England (Q3 2011), "The United Kingdom's quantitative easing policy: design, operation and impact", chart 5, p.205. Joyce M., Lasaosa A., Stevens I., Tong M. (2010) "The financial market impact of quantitative easing", Bank of England, Working Paper No. 393.

[13] Ofgem (2014), "Decision on our methodology for assessing the equity market return for the purpose of setting RIIO-ED1 price controls"; Ofgem (2013), "Strategy Decision for the RIIO-ED1 electricity distribution price control. Financial Issue.", p.21. Also Ofwat in the 2014 decision adjusted the estimate of the risk-free rate for forward-looking expectations, given the current yields on ten-year index-linked gilts were close to zero at the time of the decision. For more details see Ofwat (2014), "Setting price controls for 2015-20 – risk and rewards guidance",p.15.

[14] Gagnon, J, Raskin, M, Remache, J and Sack, B (2010), "Large-scale asset purchases by the Federal Reserve: did they work?", Federal Reserve Bank of New York, Staff Report No, 441; Meaning J., Zhu F. (2011), "The impact of recent central bank asset purchase programmes", BIS Quarterly Review, December 2011; Joyce M., Miles D., Scott A., Vayanos D. (2012), "Quantitative Easing and Unconventional Monetary Policy – An Introduction", The Economic Journal 122 (November).

[15] European Central Bank (2015), "Asset Purchase programmes and financial markets: lessons from the euro area", Working Paper Series, No.1864/November 2015.

basis points (measured on German 10-year government bond yields) and -80 basis points (measured on Spanish 10-year government bond yields), with an average effect on the 10-year government bond yields for the Euro Area of about – 40 basis points.[16]

- The Italian Regulatory Authority for Electricity Gas and Water, has recently taken into account an adjustment of about 50 basis points on the real risk-free rate of regulated services for electricity and gas sectors.[17]

The literature reviewed points out that non-conventional monetary policy, such as the ECB's QE program, have a measurable downward effect on yields of government bonds of between 20 and 100 basis points. The effect seems to be larger for countries with lower credit ratings such as Spain, and during financial and economic distressed conditions.[18] On balance we recommend that, when applying Equation 2 above, VREG increase the estimate of the risk-free rate estimated from bond yields after 22nd of January 2015 while the QE program is in place.

The ECB paper indicates that the adjustment should be higher for Member States with lower credit ratings, and specifically that the QE program depressed bond yields for Spain and Germany by 80 and 16 basis points respectively. But we also note that in the longer-term the overall cumulative effect of the QE program – once concluded – on European government

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[16] Stocks or announcement effects on 10-year Government bond yields have been empirically tested by the authors through an event study, which takes into account a broad set of official communication announcements done by the ECB on the QE program, event windows of 1 and 2 days, and controls for other macroeconomic releases. The analysis is limited to short-term effects measured during the days around the ECB announcement and do not address long-term perspectives of the overall effects of QE on assets prices and yields that will be fully measurable only at the end of the QE program. In fact, the preliminary results of the ECB paper have been estimated before the announcement of the ECB in December 2015 which extended the QE program until at least March 2017.

[17] In December 2015 the Italian "Autorità per l'energia elettrica il gas e il sistema idrico" (AEEGSI) published a directive (n.583/2015/R/com) which defines the methodology to determine and update the WACC for regulated services of electricity and gas sectors. The AEEGSI's new methodology estimates the real risk-free rate using the average government bond yields in real terms for European countries rated at least double-A, adjusts the 'raw' risk-free rate to get a minimum level of 0.5%, which approximate an upward adjustment of 50 basis points.

[18] See the ECB paper "Asset Purchase programmes and financial markets: lessons from the euro area" for additional references.

bond yields would likely be higher than that provisionally estimated by the ECB study, and may be more in line with long-term estimates released for UK and the United States, where the respective programs ended several years ago. We also note that the credit risk perception for Belgium is around mid-way between Spain and Germany. Accordingly, we recommend that VREG make an upward adjustment for German yields of around 40 basis points. When calculating the country-risk premium in Equation 2, VREG could adjust the observed Belgian yields by around 70-100 basis points.

III. Beta

III.A. Beta – 2015 Methodology

In the 2015 methodology, VREG used an asset beta of 0.33. VREG based its assessment of the asset beta on the decisions of other regulators in Europe, including the asset beta for the Dutch distribution network estimated in our 2013 study for ACM, where we found an asset beta equal to 0.35.[19] VREG also took into account the asset beta of the German network operator equal to 0.32, and the asset beta of the French network operator for the electricity distribution equal to 0.33. We find VREG's methodology of estimating an asset beta based on a survey of betas to be reasonable.

III.A. Beta Update

While we find the VREG's 2015 methodology reasonable, betas can change over time. Accordingly, we have re-estimated betas using the most up to date information available. Specifically, we have updated the estimate of the equity and asset betas in our 2013 ACM study using the same peer group. As in the ACM study, we estimate two-year daily betas, but we have also estimated five-year weekly betas to check if there is any significant difference. In the 2013 ACM study we applied a Dimson adjustment (when significant) to the daily beta estimates.[20] The ACM's WACC methodology also required us to apply a Vasicek adjustment.

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[19] The WACC for the Dutch TSOs, DSOs, water companies and the Dutch Pilotage Organisation, 4 March 2013, Prepared for the NMa (now ACM).

[20] The response of a firm's share price to movements of the market may appear the day before or the day after with respect to the market index, depending on the liquidity of the firm's shares vs. the average liquidity of the market, or because of differences in market opening time. Daily betas, which are calculated using only the correlation between the return's on the firm's shares and the return's on market index in the same day may be therefore over- or under-estimated due to lagged effects that are not taken into account. The Dimson is a standard beta adjustment which combines

Continued on next page

In our work for VREG we apply a Dimson adjustment to the daily beta estimates, but we do not apply a Vasicek adjustment. This is because, while the Vasicek adjustment is useful for estimating the beta of an individual firm, it is less useful when estimating the beta for an industry from the average of several individual betas.

The equity beta measures the relative risk of each company's equity, including the financing decisions specific to each company. To measure the relative risk of the underlying asset it is necessary to "unlever" the betas, assuming that the company is financed by all equity. We used the standard Modigliani and Miller formula (including tax shield effects) to unlever the betas of the peers.[21] Table 1 illustrates both the equity and the asset betas of each firm for both the two-year daily and five-year weekly betas.

Continued from previous page

beta estimates from the day ahead and the day before with the original beta estimate to give an overall beta which includes the information provided in the adjacent days.

[21] The Modigliani-Miller formula that we used is $\beta_{asset} = \beta_{equity}/(1 + \left(\frac{D}{E}\right) \times (1 - T))$, assuming the debt beta is equal to zero and a constant debt to equity ratio.

Table 1: Equity and Asset betas

		Daily 2 Years				Weekly 5 Years			
		Equity Beta [A]	Gearing [B]	Tax Rate [C]	Asset Beta [D]	Equity Beta [E]	Gearing [F]	Tax Rate [G]	Asset Beta [H]
Snam	srg	0.83	91.95%	31.40%	0.51	0.67	92.60%	31.40%	0.41
Terna	trn	0.65	89.57%	31.40%	0.40	0.71	94.12%	31.40%	0.43
REN	rene	0.57	174.80%	21.00%	0.24	0.42	197.16%	21.00%	0.16
Red	ree	0.70	64.38%	28.00%	0.48	0.82	94.22%	28.00%	0.49
Enagas	eng	0.68	66.87%	28.00%	0.46	0.79	82.22%	28.00%	0.50
National Grid	ngln	0.69	67.66%	20.00%	0.45	0.42	79.11%	20.00%	0.26
Elia	eli	0.44	112.77%	33.99%	0.25	0.35	130.53%	33.99%	0.19
Northwest	nwn	0.39	65.86%	40.00%	0.28	0.55	66.75%	40.00%	0.39
Piedmont	pny	0.49	58.47%	40.00%	0.36	0.68	53.53%	40.00%	0.52
TC	tcp	0.85	43.78%	40.00%	0.68	0.56	34.91%	40.00%	0.46
Median		**0.66**			**0.43**	**0.61**			**0.42**
Median Upper C.I. (95%)		0.80			0.54	0.77			0.52
Median Lower C.I. (95%)		0.53			0.31	0.46			0.32
Average		**0.63**			**0.41**	**0.60**			**0.38**
Mean Upper C.I. (95%)		0.73			0.49	0.69			0.46
Mean Lower C.I. (95%)		0.53			0.33	0.50			0.31

Source:
Brattle analysis of Bloomberg Data.

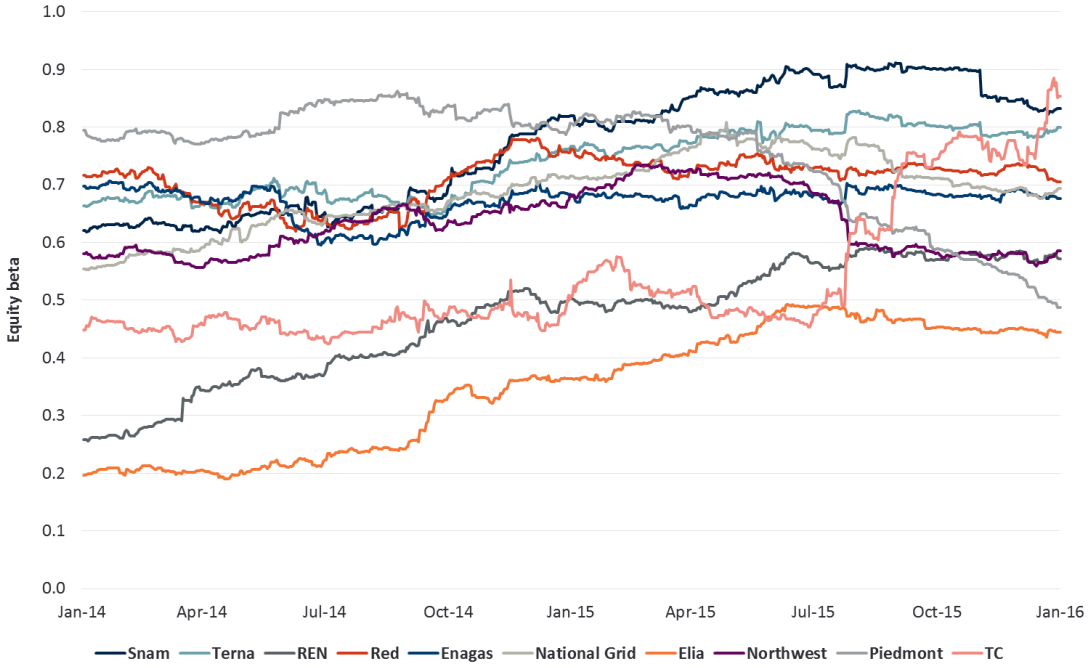
Notes:
[A]: Equity beta obtained by CAPM regression over the last 2 years from 01/02/2014 until 31/01/2016. Dimson beta is used when found significant.
[B]: 2Y average gearing.
[C]: 2015 corporate tax rate as from KPMG corporate tax rates table.
[D]: Computed as [A] / [1 + [B] x (1 - [C])]
[E]: Equity beta obtained by CAPM regression over the last 5 years from 01/02/2011 until 31/01/2016. Returns computed as from previous friday.
[F]: 5Y average gearing.
[G]: 2015 corporate tax rate as from KPMG corporate tax rates table.
[H]: Computed as [E] / (1 + [F] x (1 - [G])).
Confidence intervals for the sample mean and median are obtained by bootstrap.

Table 1 shows that the median two-year daily asset beta for transmission companies is 0.43, almost identical to the median five-year weekly beta of 0.42. Both these values are higher than the median asset beta estimated in our 2013 ACM study. Our preference when estimating a single beta from a sample is to take the median, rather than the arithmetic average beta. This is because the median beta gives less weight to 'extreme' values, so that the final estimate will be less sensitive to the inclusion of very high or low beta values. In our view this leads to a less volatile beta estimate, which is less sensitive to the inclusion or removal of individual firms in the sample.

We also recommend that VREG base its new estimate of the asset beta based on the two-year daily beta estimates. This is because in our view the two-year daily beta puts more weight on more recent information, which is preferable.

Figure 3 confirms that two-year daily betas, calculated on a rolling basis, have been increasing steadily since 2013, with more substantial changes for Elia, REN, TC, and National Grid. This indicates that higher betas we estimate are not a 'one off' occurrence or 'blip' in the data, but are representative of an underlying trend.

Figure 3: Rolling 2-years equity betas of peers



Source: Brattle analysis of Bloomberg data.

While median asset beta seems to have increased, we also note that beta estimates typically have a large statistical error. For example, the upper and lower 95% confidence intervals for our two-year daily median asset beta are 0.54 and 0.31 respectively. This means that there is a 95% chance that the true median asset beta lies within this range. VREG's previous asset beta estimate of 0.33 falls within the confidence interval, meaning that there are no statistical grounds to conclude that a beta estimate of 0.33 can be excluded as the true beta value.

However, we also note that the estimate of 0.43 is the best unbiased current estimate of the asset beta. Moreover, given the wide range of the confidence interval, by the time VREG's estimate falls outside of the 95% confidence interval, the median estimate of beta will be very different from 0.33. This means that if VREG waited until the 0.33 was outside of the 95% confidence interval, and then adjusted the beta estimate to the new best estimate of beta, then the change in beta would be very large. Introducing large changes in the parameters of the WACC calculation is to be avoided if possible, because it increases regulatory risk. We also note that VREG's asset beta of 0.33 could diverge very materially from the asset beta estimates of other regulators over time, without requiring an adjustment from a statistical point of view.

Given this, we recommend that VREG update its asset beta estimate regularly – so at every price control – rather than wait for a large adjustment to be required at some point in the future, even though it cannot be claimed that VREG's current beta estimate lies outside of the 95% confidence interval. However, given the uncertainty in the beta value, it would not be

unreasonable for VREG to approach the beta update cautiously, by for example taking the average of the previous and updated asset beta values in the next price control.

Table 2: Average asset beta in 2013 study and 2015 update

			Daily 2Y 2015 Asset Beta [A]	Daily 3Y 2013 Asset Beta [B]
Snam	srg	[1]	0.51	0.35
Terna	trn	[2]	0.40	0.34
REN	rene	[3]	0.24	0.15
Red	ree	[4]	0.48	0.60
Enagas	eng	[5]	0.46	0.61
National Grid	ngln	[6]	0.45	0.20
Elia	eli	[7]	0.25	0.13
Northwest	nwn	[8]	0.28	0.46
Piedmont	pny	[9]	0.36	0.59
TC	tcp	[10]	0.68	0.34
Median		[11]	0.43	0.35
Average		[12]	0.41	0.38
Variance		[13]	0.02	0.03
n		[14]	10	10
t-stat for the mean		[15]		0.48

Source:
Brattle analysis of Bloomberg Data.

Notes:
[A][1]-[10] Equity beta obtained by CAPM regression over the last 2 years.
[B][1]-[10] Equity beta obtained by CAPM regression between 2010 and 2013.
[11] Median of [1] to [10].
[12] Average of [1] to [10].
[13] Variance of [1] to [10].
[14] Count of [1] to [10].
[15] t-stat test for the means in [12].

Table 3 shows the equity betas of the same peers as estimated by Bloomberg, using daily and weekly data over respectively the last two years and the last five years. The betas are estimated using the same market indexes we used in our analysis.

Table 3: Equity Beta from Bloomberg and Asset Beta calculations

		Daily 2 Years				Weekly 5 Years			
		Equity Beta [A]	Gearing [B]	Tax Rate [C]	Asset Beta [D]	Equity Beta [E]	Gearing [F]	Tax Rate [G]	Asset Beta [H]
Snam	srg	0.84	91.95%	31.40%	0.51	0.64	92.60%	31.40%	0.39
Terna	trn	0.80	89.57%	31.40%	0.50	0.69	94.12%	31.40%	0.42
REN	rene	0.57	174.80%	21.00%	0.24	0.41	197.16%	21.00%	0.16
Red	ree	0.71	64.38%	28.00%	0.48	0.83	94.22%	28.00%	0.50
Enagas	eng	0.68	66.87%	28.00%	0.46	0.77	82.22%	28.00%	0.49
National Grid	ngln	0.70	67.66%	20.00%	0.45	0.42	79.11%	20.00%	0.26
Elia	eli	0.45	112.77%	33.99%	0.26	0.35	130.53%	33.99%	0.19
Northwest	nwn	0.59	65.86%	40.00%	0.42	0.52	66.75%	40.00%	0.37
Piedmont	pny	0.48	58.47%	40.00%	0.36	0.66	53.53%	40.00%	0.50
TC	tcp	0.85	43.78%	40.00%	0.68	0.57	34.91%	40.00%	0.47
Median		**0.69**			**0.45**	**0.60**			**0.41**
Upper C.I. (95%)		0.82			0.53	0.75			0.53
Lower C.I. (95%)		0.56			0.38	0.46			0.29
Average		**0.67**			**0.44**	**0.59**			**0.37**
Upper C.I. (95%)		0.76			0.51	0.68			0.45
Lower C.I. (95%)		0.57			0.36	0.50			0.30

Notes:
[A]: Equity beta calculated directly by Bloomberg on daily observations over the last 2 years from 01/02/2014 until 31/01/2016, against the relevant market index.
[B]: 2Y average gearing.
[C]: 2015 corporate tax rate as from KPMG corporate tax rates table.
[D]: Computed as [A] / [1 + [B] x (1 - [C])]
[E] Equity beta calculated directly by Bloomberg on weekly observations over the last 5 years from 01/02/2011 until 31/01/2016, against the relevant market index.
[F] 5Y average gearing.
[G] 2015 corporate tax rate as from KPMG corporate tax rates table.
[H] Computed as [E] / (1 + [F] x (1 - [G])).
Confidence intervals for the sample mean and median are obtained by bootstrap.

The Bloomberg beta estimates confirm our results from the regressions: the median daily asset beta for transmission companies calculated on two-year daily observations is 0.45, while the median weekly beta calculated over five years is 0.41. These values are very similar to our own estimates in Table 1. The small difference is because we apply a Dimson adjustment, while Bloomberg does not. The application of the Dimson adjustment improves the accuracy of the betas, because it controls for delays in the reaction of the share price to movements in the market index.[22]

III.A.1.Betas for Electricity and Gas

VREG have asked us whether there is a case that they should calculate separate betas for electricity and gas distribution.

In our view it would not be practical to calculate separate betas for electricity and gas distribution. We understand that both businesses are regulated in a very similar way in Flanders. Qualitatively, both electricity and gas distribution have a very similar systematic

[22] See footnote 20 for more discussion of the Dimson adjustment.

risk. While it is theoretically possible that the true beta for electricity distribution in Flanders is different from the true beta for gas distribution in Flanders, given the large standard error associated with beta estimates in general it would not be possible to establish this with any degree of statistical confidence. For example, we could estimate a beta based only on listed electricity distribution firms, and estimate another beta based only on gas distribution firms (assuming that we could find a sufficient number of each). But, even if the two resulting beta estimates differed, it would not be possible to say with statistical confidence that the true betas are different.

Given this, and absent any compelling reason to assume that the betas would differ, we recommend that VREG apply the same beta for both electricity and gas distribution.

IV. Equity Risk Premium

IV.A. 2015 Methodology

In the 2015 methodology, VREG estimated the ERP based primarily on a consideration of the long-run average outturn ERP, as published by Dimson, March and Staunton (DMS).[23] VREG also considered other estimates of the ERP to confirm the reasonableness of the DMS data. in more detail, VREG calculated the weighted average of arithmetic and geometric average DMS ERP estimates for a group of Eurozone countries. The weighting factor used was the total value of each country's stock market as a percentage of the total. VREG then take the simple average of the weighted geometric and arithmetic average ERPs. This is essentially the same method that the ACM applies in its WACC methodology.

In Table 4 we have updated the ERP estimate, using the 2015 methodology but applying the latest data available. The updated ERP estimate is 5.01% (rounded to 5.0%), a slight decrease from the previous value of 5.05%.

[23] Credit Suisse Global Investment Returns Sourcebook 2014, E. Dimson, P. Marsh, M. Staunton.

Table 4: Update of the ERP estimate using the 2015 Methodology

Country	Market Risk Premium 1900-2015		Market Cap. as of 31/10/2015 (USD million)	Share of Group Mkt Cap.
	Geometric mean [A]	Arithmetic mean [B]	[C]	[D]
Belgium [1]	2.4%	4.5%	360,319.42	6%
Austria [2]	2.6%	21.5%	90,415.28	2%
Finland [3]	5.2%	8.8%	178,566.47	3%
France [4]	3.0%	5.4%	1,829,077.03	31%
Germany [5]	5.1%	8.5%	1,669,926.17	28%
Ireland [6]	2.8%	4.8%	128,925.24	2%
Italy [7]	3.1%	6.5%	577,347.67	10%
Portugal [8]	2.7%	7.5%	57,630.71	1%
Spain [9]	1.8%	3.8%	652,547.00	11%
Netherlands [10]	3.3%	5.6%	372,202.22	6%
Total [11]			5,916,957.21	100%
Weighted Average [12]	3.51%	6.52%		
Assumed Weights [13]	50%	50%		
Equity Risk Premium [14]	5.01%			

Source:
[A]-[B] Credit Suisse Global Investment Returns Sourcebook 2016.
[C] Bloomberg.
[D] Ratio of the respective entry in [C] and the group total in [11].

Notes:
[1]-[10] Risk Premium relative to bonds.
[11] Sum of [1] to [10].
[12] Average weighted by share of group market capitalization.
[13] Assumed by VREG.
[14] [12][A]x[13][A] + [12][B]x[13][B]

IV.B. COMMENTS ON THE ERP

We agree with VREG's reliance on the DMS data for the ERP. In our 2012 report for the ACM, we concluded that survey results have in the past tended to be unreliable estimators of the ERP, and the results vary strongly according to the precise questions asked and the people that are asked the question.[24] Estimates of the ERP derived from Dividend Growth Models tended to be very volatile and are strongly dependent on analysts' dividend growth forecasts. We also noted that it was correct to rely on historic ERP evidence from a wider group of European countries.

[24] 2012 report for the ACM, section 4.7.

However, an area where we do note a difference between the VREG 2015 methodology and our favoured approach is in the use of the geometric mean ERP. In its estimate of the ERP, VREG uses the average of the geometric mean of historical returns and the arithmetic mean. The geometric mean is a considerably different concept than the arithmetic mean. The geometric mean of n numbers is the n^{th} root of their product. For example, the geometric mean of 3 and 12 equals 6 (the square root of 3 x 12). In the context of historical returns, the geometric mean is the single figure which, if compounded over time, would explain the cumulative total return difference of the stock market relative to government bonds. The historical return series shows a significant difference between the arithmetic mean and the geometric mean of the equity risk premium. For example between 1900 and 2015 the arithmetic mean world ERP relative to bonds was 4.4% while the geometric mean was only 3.2%. In the 2015 Methodology, the geometric ERP for the sample of European countries was 3.6%, while the arithmetic mean was 6.5%. The updated numbers in Table 4 yield similar results.

For any data series, the arithmetic mean is greater than the geometric mean except when there is no variability in the data and they are equal. Because stock market returns are variable, the arithmetic mean of past returns will always be greater than the geometric mean.

Financial experts agree that the ultimate aim is to derive an estimate of the arithmetic mean return, because this corresponds to investor's true expectation. However, there is some debate as to whether the historic arithmetic mean or the historic geometric mean provides the best forward looking estimate of the arithmetic mean.[25]

While we favour the use of the arithmetic mean, we note that the final value of the ERP that VREG estimates is reasonable. Other regulators, such as the ACM, also use the geometric mean ERP. Hence, we find VREG's approach of using the average of the historical geometric and arithmetic averages to be reasonable.

[25] For discussion on this issue see for example 'A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.' Smithers & Co. February 2003, Section 2.4.2.

V. Gearing

V.A. 2015 Methodology

In the 2015 methodology, VREG applied a gearing – being the ratio of debt to company value – of 55%. This choice was motivated by a number of factors:

- The gearing should be consistent with a credit rating of 'A';
- According to Moody's the allowable range of gearing for an A-rated firm is 45-60%;
- VREG revised the lower limit up from 45% to 50%, so that the range was 50-60%
- VREG then took the midpoint of the range;
- VREG also cross checked this value against the actual observed gearing levels for the Flemish DSOs. Based on the 2012 accounts, the average gearing was 53%,very close to VREG's 'target' level and also right in the middle of Moody's range;

V.B. Comments on gearing for the next regulatory period

We note that the WACC is relatively insensitive to the choice of gearing in the WACC decision. However, because the interest on debt is tax deductible, the WACC will reduce as the level of debt increases, until the risk of bankruptcy becomes excessive. The regulator must choose a target level of gearing which allows consumers to benefit from a lower WACC due to the presence of a 'reasonable' amount of debt.

In considering what a reasonable target gearing might be, we begin by looking at the actual gearing levels of the DSOs. We define gearing as the ratio of debt to total assets, or equivalently the ratio of debt to the sum of equity and debt. Since the DSOs are not publicly traded, we cannot measure the market value of their equity. Accordingly, the standard approach is to measure gearing as the ratio of debt to the Regulated Asset Base (RAB). This is the approach credit rating agencies such as Moody's typically apply.

However, in the case of the Flemish DSOs, the picture is somewhat more complicated. As discussed in section VIII.C, the Flemish DSOs are currently owed money for both tariff deficits and green certificates. The obligation for the regulator to pay the DSOs for certificates and the tariff deficit is an asset. As we discuss in section VIII.C.1, in Spain the networks have sold the asset represented by the obligation for the government to re-pay tariff deficits, in essence selling the right to collect the future tariff deficit repayments in return for cash today. Hence, we can think of the Flemish DSOs as having two 'sets' of assets – network assets, and assets related to the certificates and the tariff deficits.

The identification of the DSO's right to be paid for certificates and tariff deficits as an asset is important, because we understand that the DSOs have borrowed to finance the certificates and tariff deficits. If we consider the DSOs total debt – so debt related to financing network infrastructure, and debt related to funding the certificates and tariff deficits – against only the network assets (as represented by the RAB) then this would give a misleading picture of the DSOs' gearing. Calculating gearing as net debt divided by the RAB plus the certificates and tariff deficit assets would give a more accurate picture of the DSO's total debt burden relative to assets.

However, we also understand that the ratings agencies, or at least Moody's, calculates the gearing as net debt divided by RAB. Hence this measure will determine the credit rating. Accordingly, we calculate the gearing based on our preferred method – so against total assets, and using Moody's method. Below we report gearing calculated according to our preferred methodology, with the Moody's number in brackets.

When calculating the current gearing levels, we also note that the relevant factor is not the gearing of the individual DSOs, but rather the aggregate gearing of the Eandis DSOs and Infrax DSOs. This is because when looking at gearing, we are interested in the ability of the firms to sustain debt. Moreover, as of 30th December 2015 the Eandis DSOs announced their intention to formally merge to form a single DSO called 'Eandis Assets'.[26] Since credit rating agencies evaluate Eandis and Infrax DSOs as combined entities, what matters is the aggregate gearing of the DSOs in either the Eandis group or the Infrax group over all. This is what we focus on. Taking the average gearing of all DSOs could give a misleading impression, since the average may be reasonable but conceal high levels of debt on one set of DSOs which are offset by lower levels of debt in the other.

We understand that since the 2012 accounts were published, the level of debt of the 'Eandis DSOs' (Gaselwest CVBA, IMEA, Imewo, Intergem, Iveka, Iverlek and Sibelgas CVBA) has increased quite considerably. This is partly because in December 2014 the DSOs raised an additional €965 million in debt to buy-out Electrabel's 21% stake in the Eandis group.[27]

[26] See Eandis press release 30th December 2015.

[27] Credit Opinion: Eandis CVBA Moody's Global Credit Research, 10 Sep 2015, pp.3-4.

Specifically, we estimate that, based on the account at the end of 2014, the current gearing of Eandis is 69% (Moody's: 78%). Infrax has a significantly lower level of gearing at 43% (Moody's: 56%).[28]

We note that in its rating assessment of Eandis, Moody's states that, to maintain its current rating of A1, Eandis would have to achieve a net debt to RAB ratio of "comfortably below 70%".[29] Eandis's current net debt/RAB would ordinarily allow a rating of only Baa2, at best.[30] However, Moody's notes that Eandis is owned by the local authorities, which are in essence government bodies, and therefore considers it to be a Government Related Issuer, which enjoys implicit Government debt support. As a result, Moody's gives Eandis a three-notch upgrade because of the implicit support of the Community of Flanders, which is rated Aa2.

Moody's also noted that, in an effort to reduce its gearing, Eandis had raised €170 million of equity during 2015 from its shareholders. We also note that Eandis is looking for an outside investor, so as to raise more equity and reduce debt further. A transaction is likely to take place in the course of 2016. According to Moody's, the 21% share of which Electrabel sold in 2014 had a value of €910 million. Assuming that Eandis sold a similar share to an outside investor for the same price, and used the proceeds to pay down debt, then Eandis's gearing would be 67%. This is consistent with an A1 rating, according to Moody's. The presence of a private, non-Governmental investor would dilute the shareholding of government-related investors. However, provided that Eandis only sold around 20% of its shares to a private investor, the dilution would be the same as when Electrabel owned 21% of the shares. It seems likely that Moody's would still consider Eandis as a Government Related Issuer which enjoys a two or three notch upgrade relative to a fully privately owned network.

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[28] We base our numbers on the 2014 Annual reports of Infrax and Eandis. Based on discussions with VREG, we understand that there is some uncertainty on the amount of cash held by the DSOs, which may stem from which accounting convention is used, and that the DSOs actual level of gearing may be somewhat lower than we estimate based on the data in the Annual Reports.

[29] Credit Opinion: Eandis CVBA Moody's Global Credit Research, 10 Sep 2015, p.4.

[30] Eandis achieves this rating because Moody's applies a three year average net debt to RAB ratio, rather than a simple snapshot of net debt to RAB. Eandis's current net debt to RAB would rate it as only as Ba1, at best.

Table 5: Estimated Eandis gearing in 2015 (values in € '000s)

Net Debt			
Long term debt	[1]	Note	5,533,554
Short term debt	[2]	Note	516,126
Cash and cash equivalents	[3]	Note	8,913
Net Debt	[4]	[1] + [2] - [3]	6,040,767
Equity injection	[5]		-170,000
Equity sale value	[6]	Assumed	-910,000
Reduced Net Debt Debt	[7]	[4] + [5] + [6]	4,960,767
RAB	[8]	Note	7,703,481
Certificate and Tariff Deficit Assets	[9]	Note	1,033,619
Total Assets	[10]	[8] + [9]	8,737,100
Gearing, Brattle Preferred Method			
Baseline Debt to RAB ratio	[11]	[4] / [10]	69%
Reduced Debt to RAB ratio	[12]	[7] / [10]	57%
Gearing, 'Moody's' Method			
Baseline Debt to RAB ratio	[13]	[4] / [8]	78%
Reduced Debt to RAB ratio	[14]	[7] / [8]	64%

Notes:

Data as of December 31st, 2014.

[1]-[3]: Values as from Eandis 2014 Annual Report.

[8]-[9]: As from data provided by VREG.

Table 6: Estimated Infrax gearing in 2015 (values in € '000s)

Net Debt			
Long term debt	[1]	Note	986,644
Short term debt	[2]	Note	17,500
Cash and cash equivalents	[3]	Note	29,064
Net Debt	[4]	[1] + [2] - [3]	975,080
RAB	[5]	Note	1,742,523
Certificate and Tariff Deficit Assets	[6]	Note	535,965
Total Assets	[7]	[5] + [6]	2,278,488
Gearing, Brattle Preferred Method			
Baseline Debt to RAB ratio	[8]	[4] / [7]	43%
Gearing, 'Moody's' Method			
Baseline Debt to RAB ratio	[9]	[4] / [5]	56%

Notes:

Data as of December 31st, 2014.

[1]-[3]: Values as from Eandis 2014 Annual Report.

[5], [6]: As from data provided by VREG.

In the event of a successful partial sale of the firm, the expected gearing of Eandis is 57%, or 64% based on the Moody's methodology. This is still higher than Infrax's gearing of 43% (Moody's: 56%).

Given the implicit support assumed by the ratings agencies for DSOs in Flanders, an assumed gearing level of 60% would be comfortably within the A rating band. Hence a target gearing of 60% would allow Flemish consumers to benefit from a lower WACC – relative to a WACC based on lower levels of debt – without encouraging the DSOs to bear excessive credit risk.

VI. Cost of Debt

VI.A. 2015 Methodology

In the 2015 methodology, VREG estimated the cost of debt by considering that the DSOs had a mixture of debt taken out in the past, and would also raise new debt at current interest rates. In essence, VREG assumed that DSOs would maintain a constant level of debt, and that they would take out a series of fixed-interest rate loans with duration 15 years. Every year, the DSO would pay off 1/15th of the existing debt, and take out a new 15 year loan at current rates to replace the 1/15th that had been paid off, thereby keeping debt constant. Using this method, VREG estimated that, during a four year regulatory period, approximately 60% of the DSO's debt would be 'historic', so taken out before the start of the regulatory period, and 40% of the debt would be 'current'.

VREG estimated the historic cost of debt by taking the average yields on Belgian and German bonds over a 10-year period, being June 2004 to June 2014. In other words, this is the 'risk-free rate' but calculated over a 10-year period, instead of only two years. The VREG then added a credit spread of 120 basis points to obtain the historic cost of debt. The credit spread was based, among others, on a Brattle analysis, performed in 2013 for the Dutch regulator, of average spreads for generic A-rated bonds for the three year period from January 2010 to January 2013.

For the current cost of debt, the VREG employed a similar method, but added the 120 basis point credit spread to the risk-free rate, being the average of German and Belgian bonds over a two-year period. For both the current and historic cost of debt, VREG allowed a 15 basis point increase to cover debt issuing costs, which we discuss below in section VI.B.3.

In the current price control, we understand that VREG is proposing to estimate the historic cost of debt again based on a 10-year 'risk-free rate', to which it will add a credit spread of 10-

year A-rated corporate Eurozone bonds also calculated over 10-years. For the current cost of debt, VREG will apply the same methodology, but over one-year time period.

In Table 7 we summarise the main parameters relevant for cost of debt calculation.

Table 7: Cost of Debt Parameters

		[A]
Belgian yield 10-year average	[1]	3.20%
German yield 10-year average	[2]	2.55%
Cost of debt 10-year average	[3]	3.68%
Issuing Costs	[4]	0.15%
Belgian yield 1-year average	[5]	0.88%
German yield 1-year average	[6]	0.54%
Cost of debt 1-year average	[7]	1.41%

Sources:

[A]: Central Banks and VREG.

Notes:

[4]: Assumed by VREG (See VI.B.3).

VI.B. COMMENTS ON THE PROPOSED METHODOLOGY

In general, regulators take one of two approaches to the cost of debt. First, they might use what is called an 'embedded debt' cost. This is simply the network's actual cost of debt, including historic loans taken out at interest rates that may no longer reflect market levels. Using the embedded cost of debt allows the network in essence to pass through the cost of debt to tariffs and hence customers. Second, a regulator might estimate the current cost of debt for new loans. That is, the regulator imagines the cost of debt if the network were to arrange all of its debt needs at the beginning of the regulatory period.

VREG's proposed methodology is a mix of these two approaches. It reflects some elements of the embedded debt approach, in that it recognises that in practice the DSO's have 'legacy debt' and will not finance all of their operations at the interest rates which apply at the beginning of the regulatory period. On the other hand, it is not a pure embedded debt approach, because the assumptions in the VREG's methodology do not reflect the DSO's actual debts, or the way in which they borrow.

Given that:

- There is currently a large difference between the interest costs on old debt,[31] (3.68%) and the interest cost of new debt (1.41%)[32] and;

- DSOs will generally re-finance some of their debt over the regulatory period;

We think VREG's approach is sensible. The alternative of using only the cost of new debt could cause financial problems for the DSOs, because their actual interest costs would be significantly higher than those assumed for the WACC. On the other hand, if VREG used a 'pure' embedded debt approach this would ignore that DSOs will refinance some of their debts at lower rates during the regulatory period, and they would be overcompensated for their debt costs.

VREG's 2015 methodology assumed a 60/40 split between old and new debt over the regulatory period. We understand that this is based on a 'normative' approach of a hypothetical DSO.

We note there are advantages and disadvantages of VREG's proposed approach. On the one hand, refinancing decisions can respond to incentives. If VREG assumes that 40% of debt will be refinanced, then this gives DSOs an incentive to try and meet this target, thereby lowering interest rates and hence tariffs. On the other hand, if VREG's target is not achievable – perhaps because DSOs face restrictions on their ability to refinance debt – then VREG's method could risk financial distress. In our view, it is relevant to see what the actual likely level of old and new debt will be for the DSOs. Otherwise, if the assumed level of new debt is too high, then this could potentially create financial difficulties for the DSOs.

VI.B.1. Financeability Tests

VREG could consider applying so-called 'financeability tests', after it has decided on the WACC. This involves calculating the key metrics, which are typically used by the ratings agencies, to ensure that the allowed revenues and cash flows under the proposed WACC are sufficient to allow the DSOs to maintain an A credit rating.

[31] As represented by the average yield on 10-year Eurozone A-rated corporate bonds over 10 years.

[32] As represented by the average yield on 10-year Eurozone A-rated corporate bonds over 1 year.

Metrics that VREG could calculate include:[33]

- A ratio of (Funds From Operations (FFO) + Interest)/Interest of between 2.8-4.0;
- A ratio of FFO/Net Debt of between 11-18%;
- A ratio of Retained Cash Flow (RCF)/Net Debt of between 7-14%.

The metrics would be calculated for Eandis and Infrax, rather than the individual DSOs. If the metrics indicated that the proposed WACC could result in credit downgrades, VREG could discuss the results with the DSOs to investigate if the DSOs could take any actions to improve the metrics, such as investing more equity or refinancing debt more quickly than planned.

VI.B.2. Estimating Credit Spreads

In the 2015 methodology, VREG estimated the credit spread by reference to the average spread for a generic A-rated Eurozone utility bond. On the whole this seems a reasonable approach. However, in other engagements we have observed that the yields on generic A-rated debt can underestimate the actual yields for some A-rated firms.[34] This is most likely because Bloomberg calculates the generic yields using larger firms who have relatively liquidly traded debt. The debt of smaller firms may be less liquidity traded, and hence their bonds attract a higher illiquidity premium.

To check if this is likely to be an issue for the Flemish DSOs, in Figure 4 we compare the yield on generic A-rated utility bonds with the yield on Eandis's traded bonds, which have a rating of A1 (negative outlook). The data shows that while yields on the generic bonds were below the Eandis yields up to early 2013, since that date Eandis yields have actually been lower.

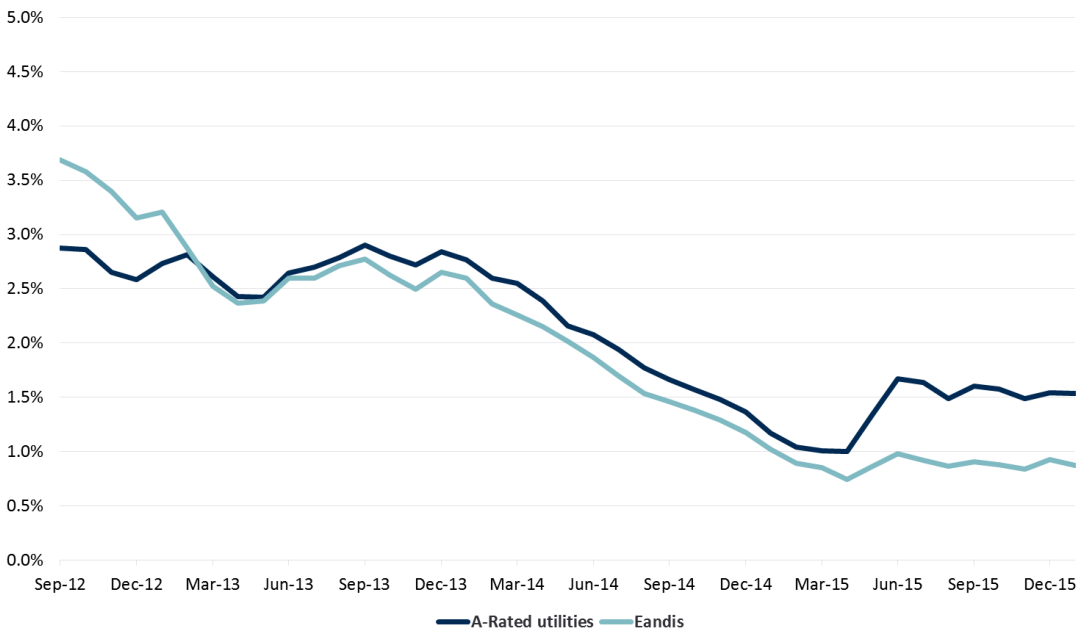
It seems like that, in terms of illiquidity premia, the Flemish DSOs have benefited from 'bundling' their debt under the Eandis 'umbrella'. We have no data on the yields of the Infrax debt, but it seems likely that they enjoy a similar benefit. We conclude that credit spreads

[33] These metrics and the ranges are those required from Moody's to obtain a baseline rating of 'Baa'. Given the uplift for the implied support by Flanders, this is consistent with an A rating. See Moody's Rating Methodology: Regulated Electric and Gas Networks, November 25 2014, p.19.

[34] See 'The WACC for Dutch Drink Water Companies' prepared for ACM, The Brattle Group, 3rd July 2015, available at: https://www.rijksoverheid.nl/documenten/rapporten/2015/10/26/the-wacc-for-dutch-drink-water-companies

based on generic A-rated utility yields provide a good proxy for the actual cost of the DSO's debt.

Figure 4: Comparison of generic A-rated bond yields and Eandis bond yields



Source: Brattle analysis of Bloomberg data.

VI.B.3. Issuing Costs

In the 2015 methodology, the VREG allowed an annual 15 basis point uplift on debt to account for the costs of using debt. These costs include advisory fees and the costs and fees of the institutions arranging the loans or bond issues.

We agree that it is reasonable to allow the DSOs to recover efficiently incurred issuing costs. However, the potential problem with the 2015 methodology is that there is a mismatch between the way that the issuing costs are allowed for in the WACC and the actual costs.

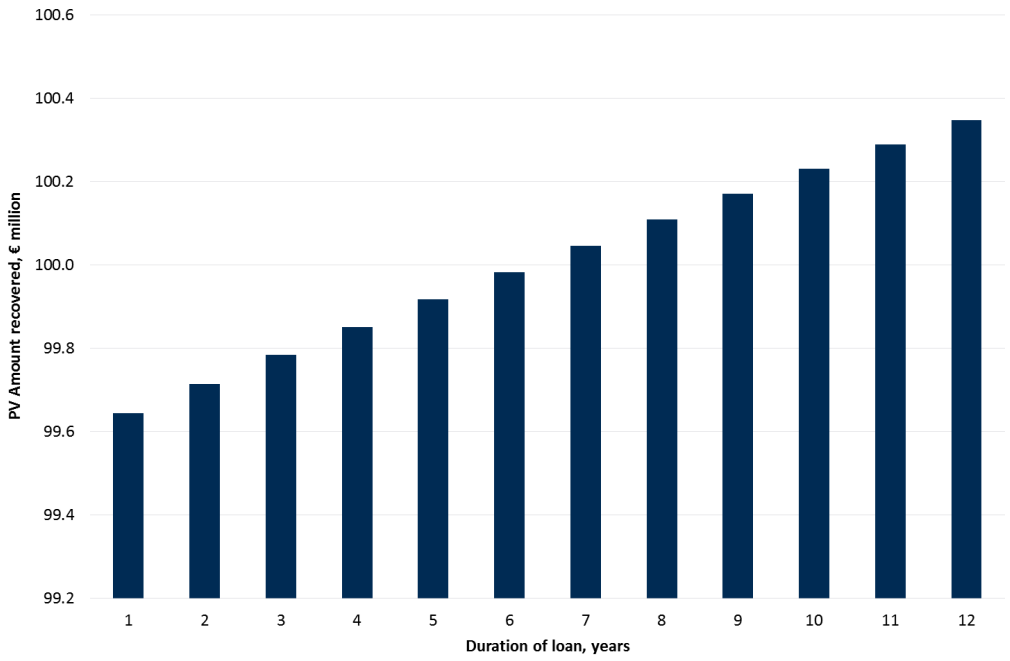
Issuing costs tend to be 'one off' – for example the DSO might incur advisors fees when the debt is issued, and pay a fee to the issuing bank of, for example, 1% of the debt issue. These costs are generally independent of the term of the debt. That is, they will be incurred whether the bond is for five years or 20 years.

In contrast, VREG's issuing cost allowance applies every year. Hence, the longer the debt, the greater the allowance for issuing costs. We illustrate this with an example below. Suppose a DSO issues debt with a value of €100 million, but out of this amount it must pay a 0.5% fee – so €500,000– to the issuing bank. Hence, the debt results in an increase in the RAB of €99.5

million. Suppose also that the cost of debt is 3%. Based on the VREG's 15 basis point uplift, the allowed cost of debt would be 3.15%.

The return on debt should allow the DSO to earn cash flows with a present value of €100 million – the cost of the debt including issuing costs.[35] Figure 5 shows that in practise, with a fixed annual debt issuing cost allowance, shorter-term debt will recover less than the actual PV cost of the debt (€100 million in this example) and longer term debt will recover more than the actual PV cost of the debt. Hence, a fixed annual uplift on the cost of debt for issuing costs creates an incentive to take out longer term debt, which may not be efficient.[36]

Figure 5: Example of debt recovery with an annual issuing cost allowance for different loan durations



Apart from the mismatch between the one-off nature of the issuing costs and the annual return allowed to compensate for them, another issue is that issuing costs are difficult to estimate. Unlike debt yields, which can be obtained from data provider such as Bloomberg or central banks, we know of no source of data which gives comprehensive estimates of issuing

[35] In this example, we assume that the loan is depreciated over its life – so that a one year loan can be depreciated in one year, and so on.

[36] Though in practice this incentive is likely to be overridden by other factors which influence the term of debt, such as matching the duration of the loans to the regulatory period and avoiding a need to refinance too much of the debt within a short space of time.

costs. Issuing costs in absolute terms will tend to vary by the size of the debt issue, its complexity and with market conditions.

Given these issues, an alternative approach could be to give the DSOs a cash allowance for issuing costs. This 'issuing allowance' could initially be based on an assessment of the DSOs' historical issuing costs, and then perhaps reduced over time to encourage efficiency gains. The issuing costs would be coherent with the level of refinancing implied by the assumption on old and new debt costs discussed in section VI.

VII. The Effect of Taxes

VII.A. How to deal with Taxes in the WACC

Since 1 January 2015, the DSOs have been liable for taxes. In the 2015 Methodology, VREG accounted for the payment of tax by calculating a pre-tax WACC as the after-tax WACC divided by (1-T), where T is the corporate tax rate. This is a standard way of calculating the pre-tax WACC.

The CAPM measures an after-tax cost of equity, and it is this after tax return that we are 'targeting' when estimating the WACC. This is because investors care about after-tax returns, and will only invest if the after-tax return is at the appropriate level. Since the DSOs must pay tax on their income, we agree with the need to make an adjustment to the calculated cost of equity, and the WACC, so that the after-tax cost of equity is at the correct level.

The first fundamental question facing VREG with respect to taxes is whether to set a tax allowance:

- Based on a target level of taxes estimated by the regulator, which is consistent with the other elements assumed in the WACC (level of debt, cost of debt etc.). We refer to this method as determining 'notional' taxes;
- Based on the actual taxes that the DSOs pay.

The DSOs' actual taxes may differ from the allowed taxes for three main reasons. First, their actual interest payments may differ from the level of interest – and hence tax deductions – assumed in the WACC calculation. This is both because the interest paid on debt may differ from the level assumed in the WACC calculation, and the total level of debt may differ. Second, some expenses may be disallowed by the tax authorities. Finally, the depreciation allowed by the regulatory regime can sometimes differ from accounting depreciation.

If VREG wanted to allow for the actual taxes the DSOs pay, and allow for these in the tariffs, there are at least two ways of doing this:

- Estimate actual taxes in advance (ex-ante) of the start of the regulatory period, and make an adjustment to the WACC to account for the actual expected level of taxes;
- Estimate taxes ex ante, and then allow taxes to be passed through in tariffs in the same way as operating costs are passed through. There could then be a 'true up' mechanisms at the end of the regulatory period, if the ex-ante forecast taxes differs from the ex post actual taxes.

In general, there is no clear consensus as to whether allowing for actual taxes is better or worse than allowing for notional taxes. In most cases, both method give similar results. For example, in the US, typical regulators allow for a notional tax by applying the VREG's 2015 methodology. Just across the border, in Canada, regulators calculate effective taxes, even though all other aspects of the regulatory regime are very similar to the US.

We note three factors in favour of estimating notional, rather than actual taxes:

- First, the calculation is simpler. Calculating actual taxes can be complex, and involves the need for a lot of data from the DSOs and analysis by the regulator;
- Second, the after-tax return may be based on a notional DSO with different gearing than the actual DSO. Hence, it seems somewhat inconsistent to allow tax based on the actual DSO costs, while giving an after-tax return based on a notional DSO;
- Third, the tariffs will be based on an 'efficient' level of tax based on the notional DSO, and higher or inefficient levels of taxes will not be passed through to customers.

Clearly, the disadvantage of calculating notional taxes is that they may over or underestimate the DSOs' actual taxes, meaning that the outturn after-tax return is either too high or too low. Also, setting a notional tax allowance could encourage the DSOs to reduce their actual taxes below the allowance, so that they can keep the difference. DSOs could do this by borrowing more debt so that the interest-tax deductions are larger.

There are two particular features of the Belgian tax regime which complicate the tax calculation for the Flemish DSOs, and lead us to recommend a hybrid approach. First, we understand that, for historical reasons, a portion of the DSOs' depreciation cannot be offset against taxes, and therefore this part of the DSOs' revenue is taxable. The non-tax deductible part of the depreciation is referred to as the 'revaluation surplus'. The revaluation surplus

relates to a specific uplift on the RAB which occurred in the past. In our view it would be difficult to deal with this issue satisfactory through an adjustment to the WACC, because the revaluation surplus varies between DSOs and over time. However, the amounts of the revaluation surplus are known in advance, and their effects on taxes are easy to calculate. Therefore we think that the best way to deal with taxes resulting from non-deductible depreciation is to allow these taxes as an endogenous 'pass through' cost for the DSOs. Barring a change in the tax rate, the costs can be predicted in advance and so their effect on tariffs can be calculated before the beginning of the regulatory period. Trying to deal with the depreciation tax through the WACC has no advantages as far as we can see, and would be less transparent.

Second, and relatedly, part of the cost of equity is tax deductible. Specifically, the DSOs can offset some equity income by an official annual notional interest rate multiplied by the equity in the DSO, after the deduction of the revaluation surplus. Again, since the revaluation surplus changes every year and between DSOs, it would be difficult to deal with this tax effect through a simple adjustment to the WACC.

VII.A.1. Conclusions on Tax

We conclude that the best way to deal with the effect of the official notional interest and depreciation of the 'revaluation surplus' on taxes is to add a specific revenue allowance for the DSOs, rather than trying to make an adjustment to the WACC.

One complicating feature is that, while the evolution of the revaluation surplus over the regulatory period is known, the notional interest rate will only be known at the beginning of October for the following calendar year. Hence, VREG would need to calculate the final tax allowance on an annual basis. However, as the calculation is simple, and depends only on one parameter which is not subject to any discretion by VREG, we do not see this as an issue. VREG could calculate a tax allowance for the first year of the regulatory period, and describe how it will calculate the tax allowance in subsequent years once the relevant notional interest rate is known. At the beginning of the regulatory period VREG could also estimate the tax allowance and hence tariffs for the full regulatory period based on an estimated notional interest rate.

In contrast, the 2015 methodology will tend to overestimate the actual taxes that the DSOs pay. The 2015 methodology does not account for the tax deduction for notional interest, which leads to an overestimate of taxes, but also neglects that some depreciation is taxable, which will underestimate taxes. Based on 2015 data, the net effect is to overestimate the DSOs' actual taxes.

VII.B. WILL TAXES AFFECT GEARING?

VREG have asked us to comment on whether the introduction of taxes could cause the DSOs to increase their debt levels, so as to reduce their tax bill.

Traditional corporate finance theory suggests the existence of a clear relationship between companies' capital structures and corporate taxation policies. According to the theory, firms take on more debt whenever it has a tax advantage, up to the level at which the tax benefits of debt are balanced out by the firm's expected bankruptcy costs.[37] In other words, a company's optimal leverage ratio should be set such that the incremental tax advantages of debt are equal to the incremental disadvantages of increasing the risk of financial distress. This theory is known as trade-off theory of capital structure.

There is a vast empirical literature testing the relevance of this theory with results ranging from taxes being a fundamental driver of capital structure decisions to having no impact. Taken together, the academic literature shows evidence of a link between taxes, capital structure decisions and firm value; however, there is no consensus around the magnitude of the tax impact on leverage ratios.

The most relevant issue for statistically testing the trade-off theory of capital structure is singling out the effects of tax rates on debt levels. That is, since tax rates and debt levels are simultaneously determined,[38] estimating whether debt levels change significantly in response to changes in tax rates leads to biased results in a simple regression settings (endogeneity problem).[39] To solve this problem, several recent papers have tested the relationship between taxes and debt by using exogenous variations in tax rates such as governments' tax cuts or other fiscal reforms.

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[37] See for instance Modigliani, F. and Miller, M. H. (1958). The Cost of Capital, Corporate Finance and the Theory of Investment. *American Economic Review*, 48, 261-97

[38] For instance, if a company issues debt, it reduces its taxable income which in turn reduces the marginal tax rate.

[39] Graham J. R. (2006). A review of taxes and Corporate Finance. *Foundations and Trends in Finance*, Vol. 1, n. 7, 573-691

Heider and Ljungqvist (2014)[40] using corporate income tax changes across U.S. states over the period 1989-2011 show that taxes have a significant asymmetric effect on capital structure choices. The authors estimate that leverage ratios increase in response to tax rate increases (i.e. +40 basis points for every percentage-point tax increase), but remain insensitive to tax cuts. They also concluded that investment-grade and profitable firms are more responsive to tax incentives.

Using an analogous approach, Faccio and Xu (2015)[41] analysed exogenous shifts in corporate tax rates across OECD countries during 1981-2009 and estimate a very similar positive relationship between corporate tax rate increases and financial leverage. Moreover, the authors found that the effects are larger in countries with relatively low tax evasion.

Panier et al. (2013)[42] and Schepens (2014)[43] apply the same method to Belgian data using the 2006 introduction of the notional interest deduction (NID). Both papers find a significant increase in the share of equity in the capital structure, thus strengthening the empirical case for the validation of the theoretical link between taxation and capital structure choices.

In sum, most of the empirical literature seems to find a positive relationship between the marginal tax rate and the gearing ratio in accordance with traditional corporate finance theory. This is also strengthened by survey evidence as reported by Graham and Harvey (2001)[44], which after interviewing 392 CFOs found that they consider debt tax shields to be moderately important in developing a company's financing strategy.

VII.B.1. Conclusions on Taxes and Gearing for Flemish DSOs

As noted above, financial theory and empirical evidence suggest that the introduction of taxation could encourage the DSOs to increase their debt.

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40 Heider F., Ljungqvist A. (2014). As certain as debt and taxes: Estimating the tax sensitivity of leverage from exogenous state tax changes. *Journal of Financial Economics*, forthcoming.

41 Faccio M., Xu J. (2015). Taxes and Capital structure. *Journal of financial and quantitative analysis*, Vol. 50, Issue 3, 277 – 300.

42 Panier F., Perez-Gonzales F., Villanueva P. (2013). Capital Structure and taxes: what happens when you (also) subsidize equity?. *Working Paper*, Stanford University

43 Schepens, G. (2014). Taxes and bank capital structure. *Working paper,* Ghent University

44 Graham J. R., Campbell R. H. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of financial economics,* Vol. 60, Issues 2-3, 187-243

The DSOs will only have an incentive to increase debt if they can keep the benefits of the lower taxes. If VREG set the tax allowance based on the actual tax costs, then the DSOs would have no incentive. However, our recommendation is to use a hybrid approach under which the DSOs would benefit if their actual taxes were lower than the allowance. Hence, there is an incentive to increase debt under our recommended approach to taxes.

However, we see three offsetting factors. First, in the case of Flanders and Belgium, and as noted above, the official notional interest deduction on equity reduces the incentive to increase debt. The ability to deduct a notional return on equity from taxes reduces the incentives to 'gear up' – every dollar of debt added to replace equity loses the notional interest offset. Hence the additional incentive to take on debt is driven only by the difference between the notional interest rate and the cost of debt. Using the updated 2015 methodology the cost of debt would be 3.10%, whereas the notional 2016 interest rate is1.131%.

Second, VREG calculates the cost of debt assuming an A credit rating. If DSOs increased their debt excessively, they could lose their A rating, and their actual cost of debt would be higher than that allowed in the WACC. This could offset the tax benefits of a larger amount of debt.

Finally, as a practical matter, Eandis, which represents over 80% of the Flemish DSO's total RAB, could not realistically increase its debt any further. As noted in section V, it is under pressure from the ratings agencies to reduce its debt. Hence, it is only Infrax that might be interested in increasing its debt so as to reduce its tax bill.

Accordingly, there does not seem to be a high risk that applying notional taxes could encourage DSOs to increase debt to 'dangerous' levels. However, to further reduce the risk, it could be prudent for VREG to make a 'A' credit rating mandatory for DSOs, rather than simply assuming an A rating when calculating the cost of debt and gearing. We do not know what policy instruments VREG has available to do this, but one possibility is that VREG could fine DSOs that do not maintain an A rating. This would provide an additional incentive for DSOs not to borrow excessively for tax purposes.

VII.C. WILL TAXES AFFECT BETA?

VREG have also asked us whether it is realistic that the introduction of taxes on January 1 2015 for Flemish DSOs affect's the DSOs' beta. We note that all of the firms from which we estimate beta – the peer group – pay taxes. Hence, regardless of whether the Flemish DSOs pay taxes or not, we would have included the effect of taxes when unlevering the equity betas of the peer group to arrive at an estimate of the asset beta. The introduction of taxes for

Flemish DSOs does reduce their equity beta, because some of the variation of the value of the firm is now offset by tax deductions.

VIII. Other Issues

VIII.A. Illiquidity Premium in the CAPM

VREG have explained that some DSOs have argued for a premium in the WACC, to account for the fact that they are relatively small, and are not publicly traded firms, and so the shares are harder to sell. The DSOs argue that as a result they suffer from an illiquidity discount, and that this should be reflected in the WACC. We understand that the previous Federal (CREG) WACC methodology included an adjustment for illiquidity.

We agree that investors will discount the value of assets which are less liquid. This illiquidity premium can be in the range of 10-20%, depending on the asset. We have applied liquidity discounts in other work when valuing assets.

In the case of the DSOs, it seems that the claimed liquidity discount relates to the idea that it might be hard to find a buyer because, for example, the regulatory regime might be hard to understand, there may be unknown environmental liabilities etc. These elements take time for a buyer to understand. The DSO would have to offer a discount to get a quick sale and compensate the buyer for the unknown risks.

However, the 'liquidity discount' argument above appears to be a 're-packaging' of regulatory risk. If the regulatory regime was 100% transparent and trustworthy, with a guaranteed reasonable cost recovery, the DSO asset should be as easy to sell as a bond. The WACC we apply already compensates for regulatory risk, so applying a liquidity discount to account for these factors would be double counting.

More generally, it is not clear that the DSOs do suffer from an illiquidity discount. While the individual DSOs are relatively small, the aggregated holding companies – Eandis and Infrax – are not. Eandis has a RAB of €7.7 billion, and Infrax of €1.7 billion. When Electrabel sold its stake in Eandis, the implied equity value of Eandis at the time (being the difference between the debt and the RAB) was about €2.6 billion. This implies that a 21% share would be worth €550 million, and the reported sale value was nearly double this amount (€911 million).[45]

[45] See http://www.flanderstoday.eu/business/electrabel-sells-eandis-eu911-million

This implies that Eandis's is valued at a significant premium to its RAB. We also note that the proposed sale of a stake in Eandis has attracted interest from international investors. There appears to be is a willing pool of sophisticated institutional investors interested in buying network assets in the EU. Hence, it seems that at least Eandis does not suffer from a liquidity discount. Infrax is clearly smaller than Eandis. But it is not clear that any illiquidity discount would vary with the size of the firm. Rather, it relates to the regulatory regime which is the same for all DSOs in Flanders, regardless of size. Accordingly, we conclude that no adjustment needs to be applied.

VIII.B. Calculation of and Return on Working Capital

VIII.B.1. Amount of Working Capital

In the 2015 methodology, VREG have placed an upper limit on the working capital requirements for the DSOs, equal to 1/14th of the revenues.

We agree with VREG's approach to place a limit or cap on the value of working capital, since otherwise DSOs could hold inefficiently high levels of working capital. We also agree with VREG's method for estimating a reasonable level of working capital, which employs a standard technique for estimating the 'cash cycle'. This is essentially the number of days difference between the time that the DSO has to pay for services and the time that it gets paid by its customers. VREG estimates an average cash cycle of 26 days, or 1/14th of a year. The maximum working capital is therefore revenues multiplied by 1/14.

VIII.B.2. Return on Working Capital

In the 2015 methodology, VREG reasoned that working capital was a short-term funding requirement, which would most likely be funded by short-term borrowing. Accordingly, VREG determined that working capital should earn a return equal to the cost of debt.

It is correct that working capital bridges a short-term funding gap, essentially between when the DSO pays for services and when it gets paid. However, the 'cash cycle' analysis described above should quantify the need for working capital that is essentially permanent. Permanent working capital is a long-term feature of the DSO's business, similar to capital invested in pipes and wires. Because working capital must be financed over the life of the business, it will be funded in much the same way as other assets in the business – through a mix of debt and equity – and should therefore earn a return equal to the WACC.

For example, in their seminal textbook on corporate finance, Professors Berk and De Marzo discuss the 'matching principle', which states that "short-term [financing] needs should be

financed with short-term debt and long-term needs should be financed with long-term sources of capital". They go on to note that:

> "Permanent working capital is the amount that a firm must keep invested in its short-term assets to support its continuing operations. Because this investment in working capital is required so long as the firm remains in business, it constitutes a long-term investment. The matching principle indicates that the firm should finance this permanent investment in working capital with long-term sources of funds. Such sources have lower transaction costs than short-term sources of funds, which would have to be replaced more often."[46]

We conclude that the DSOs should be allowed to earn the WACC on their permanent working capital requirement. This could perhaps be achieved most simply by adding the permanent working capital requirement to the RAB.

VIII.C. Return on the Tariff Deficit

We understand that, in common with several other Member States, the DSOs have accumulated tariff deficits. This is partly because the DSOs were obliged to buy green certificates, some of which they were subsequently unable to sell, and partly because of the freeze in tariffs which occurred prior to 2015.

The tariff deficits are not included in the RAB, but are remunerated separately at a different rate than the WACC. Specifically, the DSOs earn an annual return at the statutory rate of EURIBOR plus two percentage points on the outstanding tariff deficit balance.[47] VREG has asked us to comment on whether the statutory rate is the appropriate rate of return for the DSOs' tariff deficit.

We start by noting the appropriate interest rate depends on the risk of the borrower. In this case, one could argue that the 'borrower' is in effect the Region of Flanders, which for the purpose of this discussion we take to be the same as the Belgian state.[48] Belgium has in effect

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[46] J. Berk and P. DeMarzo, Corporate Finance: The Core, 1st Ed., 2009, p. 914.

[47] In more detail, the Belgian statutory interest rate for calendar year T corresponds to the average 12-month EURIBOR interest rate during December of year T-1, rounded to the upper quarter percent, and then increased by two percentage points.

[48] Since Flanders has no traded bonds, and so we cannot distinguish between the credit risk of Flanders and the credit risk of Belgium.

asked the DSOs to carry out a policy on its behalf, and then promised to pay the DSOs for the cost of carrying out the policy at a later date. If the Belgian state becomes more indebted, so that the risk of a default rises, then the risk that the tariff deficit will not be fully re-paid to the DSOs also increases. Therefore, the yield on a Belgian bond would seem to provide appropriate compensation for the risks that the DSOs bear on the tariff deficit. According to Moody's, the tariff deficit should be re-paid by about 2020, so in roughly five years' time. Accordingly, the yield on a five-year Belgian bond would seem to best reflect the term of the tariff deficit 'loan' that the DSOs have made to Belgium.

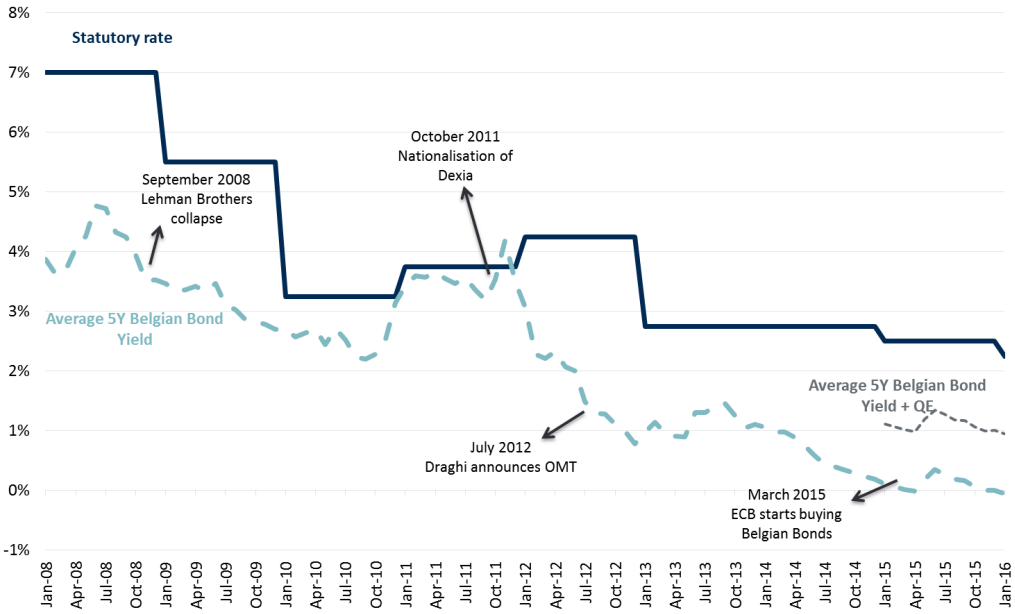
In contrast, EURIBOR does not reflect the ability of the Belgian state to re-pay its debts, and therefore does not reflect the financial risk that the Flemish DSOs bear with respect to the tariff deficit.

In Figure 6 we plot the statutory rate against the yield on a Belgian government bond with 5-year maturity. From 1 January 2015 we have also included a series which shows the Belgian bond yield with the maximum upward adjustment of 100 basis points, to account for the effect of Quantitative easing on bond yields, discussed in section II.C. Figure 6 illustrates that, had the statutory rate been applied in the past, even assuming the maximum possible adjustment for QE effects, it would have over-compensated the DSOs for the risk that they bear with respect to the tariff deficit.

While the five-year Belgian bond rate, even with a QE adjustment, is clearly below the DSO's average cost of debt, it should reflect the additional debt costs that the tariff debt imposes on the DSOs. Put another way, given that the tariff deficit is in effect guaranteed by the Belgian state, the DSOs should be able to borrow funds pledged against the tariff deficit guarantee at this rate.

We understand that the statutory rate is fixed annually at the beginning of the calendar year. VREG could perform a similar annual interest rate setting exercise, but instead taking the average Belgian bond yield in the previous December. The Belgian central bank publishes constant maturity bond yields. Therefore VREG should calculate the interest rate every year from the yield on a bond which will mature in 2020, or else the most likely date that the tariff deficit will be paid off.

Figure 6: Statutory Rate Compared to Belgian bond yield since 2008



Source: Brattle analysis of Bloomberg data.

VIII.C.1. Tariff Deficits: The Experience of Spain

The experience of Spain provides a useful precedent with respect to the yield on the tariff deficit. Energy companies in Spain have accumulated a very significant tariff deficit of around €30 billion. The tariff deficit has exposed several Spanish power companies to cash shortfalls. In response, Spanish power companies have 'securitised' the tariff deficit debt.

The process of securitisation involved the sale of collection rights by Spanish power companies to independent investors in exchange for cash ("Private Tariff Deficit Securities"). The independent investors stand to receive their cash back, plus interest, through a fixed stream of annual payments over time, which Spain has guaranteed.

Spain has purchased a further €26 billion in collection rights through a dedicated fund, the *Fondo de Amortización del Déficit Eléctrico* ("FADE"). FADE has financed the purchases by issuing debt securities. Unlike the Private Tariff Deficit Securities, FADE debt carries an explicit sovereign guarantee by Spain.

The Private Tariff Deficit Securities have debt ratings that now stand around BBB or A3, the same or slightly better than Spanish Sovereign bonds. FADE bonds have the same rating as Spain itself. The debt ratings reflect regulatory risk, in the form of concerns with the prospective delay or insufficiency of collection rights, and the consequent reliance on the Spanish Government to cover shortfalls. The experience of Spain indicates that the yield to

the tariff deficit will be closely related to the yield on the bonds of the State which is guaranteeing the deficit.

We note that, in Spain, guidance by ratings agencies allow for Tariff Deficit securities (either private or FADE) to command a rating of up to three notches higher than the host sovereign.[49] This is because although Spain itself may encounter financial problems and default on its loans, there is little likelihood that Spanish consumers would ever stop paying their utility bills. Similarly in Belgium, we understand that the tariff deficit will be re-paid by a surcharge on consumer bills. Accordingly, the Belgian bond yield likely represents a maximum interest rate for the tariff deficit. In practise the correct rate may be somewhat lower, to the extent that lenders see a recovery of the tariff deficit directly from tariffs as a less risky proposition than payment by the Belgian state. However, in the case of Belgium, and unlike Spain, we lack an independent credit rating for the tariff deficit. In the absence of better information, the yield on the Belgian government bond seems to be the best proxy.

VIII.D. PERIODIC UPDATES OF THE WACC

The duration of the regulatory period starting on 1 January 2017 is not yet known, but it may well last 3-4 years. If VREG fixes the WACC for a four-year period, there is a risk that unforeseen changes in the WACC could occur during the regulatory period, leading to the DSOs being either under or overcompensated. On the other hand, the possibility of revisiting the WACC decision mid-way through the regulatory period could increase regulatory risk. VREG have asked us whether there should be a possibility to adjust the WACC mid-way through the regulatory period.

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[49] Fitch Ratings, "Rating Criteria for Portuguese and Spanish Electricity Tariff Deficit Securitisations", (15 May 2014), p. 1. Fitch identifies five principal ratings drivers: a) *sovereign risk* because "electricity supply is an essential service that is both supported and influenced by the overall economic strength of a country and its legal framework"; b) *regulatory environment* because "the power and independence of the electricity regulator are critical factors in determining whether the Tariff Deficit (TD) securitisation ratings can be higher than those of the sovereign"; c) *electricity system sustainability* because "TD securitisation ratings are influenced by the economics of the electricity system"; d) *payment interruption risk* relating to the risk of defaults by system participants; and e) *legal analysis* reflecting the need for the law "to provide for adequate recognition, ring fencing and repayment deadlines for TD rights". Fitch proceeds to state: "TD securitisation ratings can be up to three notches above the sovereign IDR (Issuer Default Rating) when: 1) the leverage and liquidity KPIs (Key Performance Indicators) support the hypothesis of a sustainable electricity system from a fundamental economic perspective; 2) the regulation framework is clear and the regulator is sufficiently independent; and 3) the TD legal framework is stable". *Ibid.*, pp. 6-7.

First, we note that a 3-4 year regulatory period is quite typical, and NRAs regularly fix the WACC for this period of time without having the possibility of a mid-term adjustment. Ofgem has instigated a mid-period review, but only because it has adopted an exceptionally long eight-year regulatory period. We also note that the DSOs can, and do, hedge their interest cost so that they would be relatively unaffected financially by an increase in interest rates. Moreover, VREG's debt methodology – which gives significant weight to older debt – also has the effect of reducing the impact of changes in interest rates over the regulatory period. This is because the interest rate changes only apply to new debt, which is a minority of the overall debt costs.

Despite this, we cannot rule out that an unexpected change in interest rates during the regulatory period could either create financial losses or a windfall for the DSOs. Accordingly, one possibility would be to proceed as follows:

- VREG could monitor the progress of the risk-free rate over the regulatory period, including any QE adjustment (the adjusted risk-free rate);
- If the adjusted risk-free rate is 'X' percentage points more or less than the adjusted risk-free rate in the WACC decision for a given number of consecutive days (for example six months), VREG could commit to review whether the risk-free rate and the debt credit spread need to be adjusted. We refer to this as the 'trigger' condition for a WACC review, and the difference between the calculated risk-free rate and the value of X as a 'dead band', in that if interest rates vary within the dead band no adjustment needs to be made;
  - VREG could commit to only adjust the risk-free rate and the credit spread which applies to new debt. VREG would commit not to adjust any other element such as the ERP or beta;
  - Once the trigger condition is met, VREG should commit to reach a decision on the WACC within a relatively short period of time – for example two months – so as to minimise regulatory uncertainty.

For example, the trigger mechanism could come into effect if the ECB's QE program stopped unexpectedly, causing Belgian bond yields and interest rates generally to increase. In such a case, VREG might conclude that no WACC adjustment was required, since the WACC

decision already accounted for the effect of QE. The CER, the Irish energy regulator, has applied a similar regime.[50]

VREG could determine the X percentage points to be used in the trigger based on consultation and an analysis of what level of increase in interest costs could result in a material risk of financial distress for the DSOs. The width of the 'dead band' does not need to be symmetric – for example interest rates could be more likely to go up unexpectedly than down. VREG could say that if interest rates are persistently more than 1 percentage point *higher* than the risk-free rate a review will take place, but that VREG will review rates if rates are persistently 0.5 percentage points *lower* than the risk-free rate.

[50] The CER has adopted a trigger mechanism which depends on the movement in the real yields of Irish sovereign bonds. A change of 0.5 percentage points in the real yields on Irish sovereign bonds is the threshold which must be reached before the CER will make any change to the WACC in future years. See for example CER Decision paper CER/12/194, 23 November 2012.

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