The WACC for the Flemish DSOs for the regulatory period starting in 2025

SUBJECT LINE

PREPARED BY

Dan Harris
Lucrezio Figurelli

PREPARED FOR

VREG

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Brattle

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I. Introduction and Summary

The Flemish Regulator for Electricity and Gas VREG (*Vlaamse Regulator van de Elektriciteits en Gasmarkt*) is responsible for the economic regulation of the electricity and gas Distribution System Operators (DSOs) in Flanders. Since 2018 – following the merger of Eandis System Operator and Infrax CVBA – Fluvius System Operator CVBA (Fluvius) has become the only company managing the electricity and gas DSOs in Flanders.

Among other tasks, VREG is responsible for the approval of the distribution network tariffs and the determination of the tariff methodology based on which these tariffs must be determined. An important element of the tariff methodology is the allowed return on capital for the DSOs. In common with most regulators, VREG sets the allowed return equal to the estimated Weighted Average Cost of Capital (WACC) for the DSOs. Annex 2 of the 2021-2024 Tariff Methodology details VREG's latest calculation of the WACC for the Flemish DSOs for the years 2021-2024.[1]

Against this background, VREG has commissioned The Brattle Group to prepare a study on the WACC of the Flemish electricity and natural gas DSOs for the next regulatory period starting in 2025.

VREG has instructed us to start from VREG's current methodology – as set out in the Annex 2 of the 2021-2024 Tariff Methodology – and to only make reasoned recommendations for modifications to the methodology, bearing in mind the goals of ensuring stability and predictability of the regulatory framework.

In preparing this report, VREG has further asked us to account, as relevant, for the expected future developments that the electricity and natural gas sectors will undergo, and to conduct appropriate sensitivity and benchmark analyses in the calculation of the relevant WACC parameters.

VREG has further asked us to consider a regulatory period of four years – that is, 2025-2028 – and to advise on whether an infra-period adjustment to the WACC may be warranted.

[1] Rate methodology regulatory period 2021-2024: Appendix 2 Capital cost reimbursement report, 8 October 2021.

In preparing this report, we use data up to and including 31 December 2023, being the most recent data available at the time of our analysis, to calculate the WACC for the Flemish DSOs for the regulatory period starting in 2025. Consistent with VREG's 2021-2024 Tariff Methodology we round the individual WACC parameters at the closest second decimal point and the overall WACC to the closest first decimal point.

A. Cost of Equity

Risk-free rate. In line with VREG's 2021-2024 Tariff Methodology, we calculate the risk-free rate based on a weighted average yield of the 10-year Belgian and German government bonds over a one-year averaging and assigning a 75% weight to the Belgian bond and a 25% weight to the German bond. Over the one-year period ending on 31 December 2023, yields were 3.11% on average in Belgium, and 2.46% on average in Germany. Taking the weighted average between the two gives us a risk-free rate of 2.95%, which we apply to the WACC for the next regulatory period.

Equity risk premium (ERP). We calculate the ERP using long-term historical data on the excess return of shares over long-term bonds for the Eurozone economies published by Dimson, Marsh and Staunton (DMS), which is one of the most widely used sources for long-run excess returns. In line with VREG's 2021-2024 Tariff Methodology, we select the ERP based on the average of the arithmetic and geometric realized ERPs for the Eurozone countries for which DMS have data, using the market capitalization of each country's stock market as weights. Using data from the 2023 DMS report, we find that weighted average ERP for Eurozone countries was 5.20%, which we apply to the WACC for the next regulatory period.

Selection of the peer group. In the 2021-2024 Tariff Methodology, VREG estimated the beta by reference to the betas of a sample of 10 listed and liquidly traded European and US energy networks. In this report, we start considering the same candidate peers considered in 2021 by VREG. To this initial list we add the Belgian TSO Fluxys and the Romanian TSO Transgaz, since they are European energy networks with similar regulatory frameworks and facing similar risk as Fluvius. This gives us an initial list of 12 candidate peers. We then apply a number of screening criteria to ensure a reliable beta estimate. In particular, we check that the candidate peers earn a majority of their revenues from regulated activities, have an investment grade credit rating, and are sufficiently liquid. We further check whether any of the candidate peers was involved in substantial mergers and acquisitions (M&A) activity. Application of these screening criteria led to the exclusion of four candidate peers: EDP, National Grid, Fluxys and TC Pipelines. Hence, we consider a final sample of eight companies.

Beta. In the 2021-2024 Tariff Methodology, VREG estimated the asset beta for the Flemish DSOs by reference to the median asset beta of the peers using a daily frequency and a reference period of 2 years, from January 1, 2018 to December 31, 2019. The simple OLS betas were also assessed against Dimson-adjusted betas, but tests performed showed that the Dimson adjustment was not needed for any company in the peer group.

In this report, we have updated VREG's previous estimate of the beta using the sample of eight comparable companies discussed above, and applying data that was available as of 31 December 2023. In line with the2021-2024 Tariff Methodology we consider both the simple OLS betas and Dimson adjusted betas. Overall, we find that the medians of the OLS betas and of the Dimson adjusted betas are both equal to 0.34. By re-levering an asset beta of 0.34 using the Hamada formula and applying a notional gearing (D/D+E) of 60% and the applicable tax rate in Flanders of 25%, we derive an equity beta of 0.72, which we apply in our WACC calculations.

VREG also asked us to assess whether future developments of the energy sector in Flanders may affect the cost of capital of the Flemish electricity and natural gas DSOs in a way that the current methodology does not reflect. One foreseeable development is the so called 'energy transition'. Over the next decades, the use of electricity is expected to increase substantially, while the use of natural gas will decrease progressively.

There are broadly two ways in which the energy transition could affect the beta of the Flemish DSOs. *First*, expected changes in volumes (and particularly expected declines in natural gas volumes) may directly affect the systematic risk faced by the gas DSOs, and hence affect their beta. *Second*, significant differences in future investment requirements may create a difference in the asset betas of gas and electricity networks. With respect to the first effect, we conclude that any decline in gas volume will not be correlated with the market index, and is therefore not systematic. Hence, there should be no effect on the beta and the cost of capital of the Flemish DSOs. With respect to the second affect, our analysis shows that the investment requirements for Fluvius electricity distribution networks are unlikely to affect its beta differently from the peers.

B. Cost of debt

In the 2021-2024 Tariff Methodology, VREG estimated the cost of debt as a weighted average of historic (60%) and new debt (40%), plus a 0.15% allowance to cover the costs of issuing debt, such as legal and banking commission fees. Cost of old and new debt were both calculated by reference to the yields of an A-rated 10-year utility index. The cost of historic debt was initially based on a 10-year average and later replaced by a 7-year average. The cost of new debt was based on a 1-year average.

We note that VREG's current methodology applies a notional level of gearing (D/(D+E)) of 60%, which is most consistent with an A3 rating according to Fitch and Moody's rating methodologies. Accordingly, to ensure consistency with the assumed level of gearing, we recommend VREG to consider the notional cost of debt of an efficient operator with an A3 rating.

In order to update the calculation of cost of debt for the next regulatory period we consider the yields of the A-rated and BBB-rated 10-year utility index published by Bloomberg. We note that the A-rated index is composed of bonds issued by utilities with a rating of A1, A2 and A3, whereas the BBB-rated utility index of bonds issued by utilities with a rating of Baa1, Baa2 and Baa3. Therefore, taking the average of these two indices would provide the best reflection of the cost of debt of an efficient operator with an A3-rating. Accordingly, we have updated the calculation of cost of debt for the next regulatory period by considering the average yield of the Bloomberg's A-rated and BBB-rated 10-year utility indices over the relevant averaging periods.

We consider a 10-year averaging period for the cost of old debt and a 1-year averaging period for the cost of new debt. In line with the 2021-2024 Tariff Methodology, we consider a notional capital structure of an efficient DSO who finances itself through financial debt with a maturity of 10 years. We analyse the expected capital repayments and new long-term borrowings of Fluvius over the next regulatory period and determine that using a notional weight of 65% for historic debt and 35% for new debt would be reasonable and consistent with the notional approach.

Overall, we find that the 1-year average yield of the Bloomberg A-rated and BBB-rated Euro utility Indices as of 31 December 2023 was equal to 3.78%, while the 10-year average was equal to 1.58%. By applying a 65%-35% weighting of historic and new debt we derive a cost of debt of 2.35%, which increases to 2.50% when we add 15 bps to account for the costs of issuing debt. We apply a value of the cost of debt of 2.50% in our WACC calculations.

C. Conclusion on the WACC for the Flemish DSOs

In Table 1 we report our calculation of the nominal pre-tax WACC for the Flemish DSOs for the next regulatory period starting in 2025, using data as of 31 December 2023. Consistent with the 2021-2024 Tariff Methodology, in calculating the WACC we consider a notional gearing (D/(D+E)) of 60% and the statutory tax rate of 25%. Overall, based on the parameter values identified above we derive a value of the nominal pre-tax WACC of 5.1%.

TABLE 1: SUMMARY OF WACC ESTIMATES

			VREG 2021-2024 [A]	Brattle December 2023 estimate 2025-2028 [B]
Risk-free Rate	[1]	See note	0.09%	2.95%
ERP	[2]	See note	4.81%	5.20%
Asset beta	[3]	See note	0.39	0.34
Equity beta	[4]	[3]x(1+(1-[6])x[10])	0.83	0.72
Cost of equity	[5]	[1]+[4]x[2]	4.08%	6.69%
Tax rate	[6]	See note	25.00%	25.00%
Pre-tax cost of equity	[7]	[5]/(1-[6])	5.44%	8.92%
Cost of debt	[8]	See note	2.14%	2.50%
Gearing (D/A)	[9]	See note	60.00%	60.00%
Notional Gearing (D/E)	[10]	[9]/(1-[9])	150.00%	150.00%
Nominal WACC (Vanilla)	[11]	(1-[9])x[5]/+[9]x[8]	2.9%	4.2%
Nominal WACC (pre-tax)	**[12]**	**(1-[9])x[5]/(1-[6])+[9]x[8]**	**3.5%**	**5.1%**

Notes and sources:
[A]: VREG, Tariefmethodologie reguleringsperiode 2021-2024 Bijlage 2 Rapport kapitaalkostenvergoeding, 8 October 2021.
[B][1]: 1-year average of German and Belgian 10-year government bond yields weighted 0.25 and 0.75 respectively.
[B][2]: DMS average Equity Risk Premium as of end 2022 for the Eurozone countries weighted by market capitalization.
[B][3]: Median of the 2-year daily beta of a sample of comparable companies as of 31/12/2023.
[B][6]: Corporate tax rate in Belgium (2023), KPMG.
[B][8]: Weighted average of the 10-year (65%) and one-year (35%) average yields of the Bloomberg A-rated and BBB-rated utility Indices plus 0.15%.
[B][9]: Assumed in line with VREG 2021-2024 WACC decision.

D. Structure of the report

This report is organized as follows:

- Sections II to VII detail our assessment of the individual WACC parameters for the next regulatory period (2025-2028), namely the risk-free rate (Section II), the Equity Risk Premium (Section III), the peer group (Section IV), beta (Section V), the cost of debt (Section VI), gearing and tax (Section VII).
- Section VIII reports our calculation of the nominal pre-tax WACC for the Flemish DSOs for the next regulatory period 2025-2028.
- Section IX benchmarks the value of the WACC for the Flemish DSOs against the values approved by other European and Belgian regulators, adjusted for differences in the risk-free rate and cost of debt driven by the date at which the WACC was measured.

- Section X discusses our recommendation for an annual update of the WACC and details how VREG could proceed to perform such update.
- Section XI assesses VREG's approach to financeability and discusses the results of financeability tests we have run on Fluvius cost of debt.

This report also contains three appendices.

- Appendix A provides detailed results on the screening of the sample of peers used to estimate beta.
- Appendix B provides further details on the estimates of the equity and asset betas for the peers.
- Appendix C provides further details on the individual bonds considered in the analysis of Fluvius bonds discussed in Section XI.

II. Risk-Free Rate

In the 2021-2024 Tariff Methodology, VREG calculated the risk-free rate based on a weighted average yield of the 10-year Belgian and German government bonds. VREG's calculation considered a one-year averaging period for the individual country's yields and assigned 75% weight to the Belgian bond and 25% weight to the German bond.

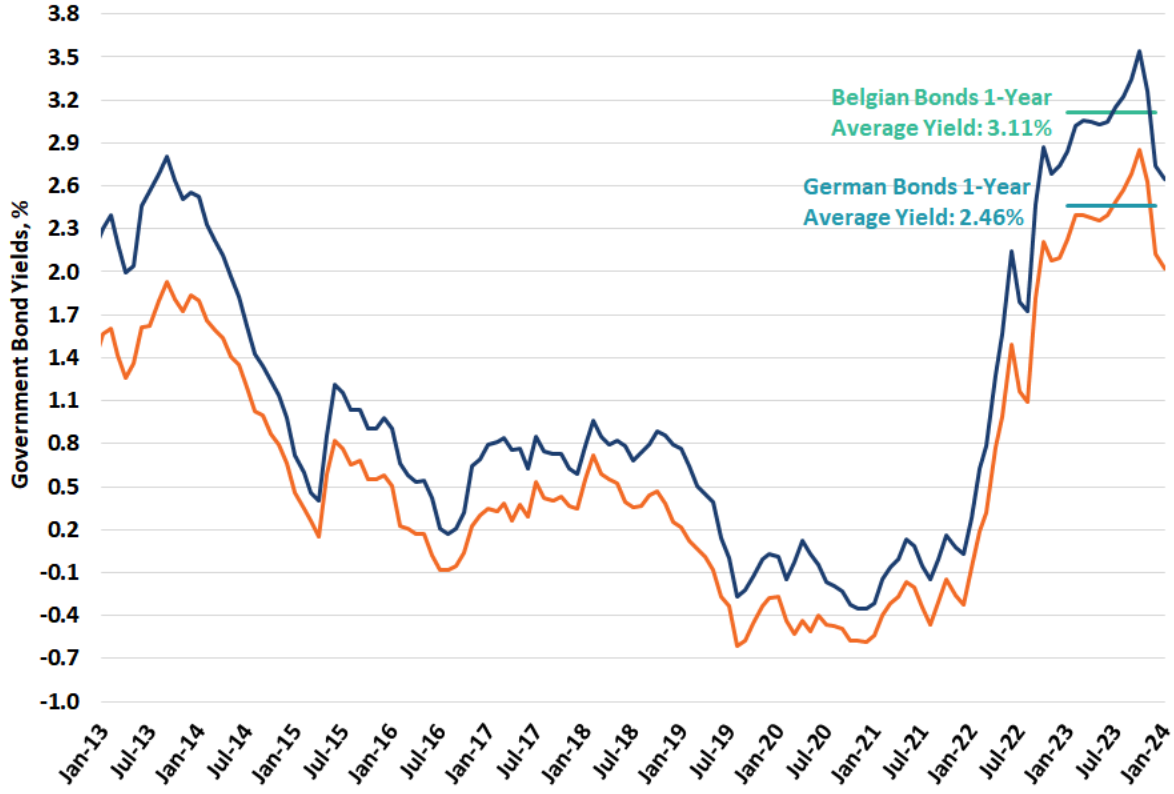
Figure 1 illustrates the evolution of the yields of 10-year government bonds over the past 10 years in Belgium and in Germany. As a measure of the yield of 10-year government bonds, we rely on the 'Daily yield of the current 10 year federal bond' published by the German Central Bank for Germany and the 'Reference rate of OLOs with 10 year residual maturity' published by the Belgian Central Bank for Belgium.[2]

Nominal government bond yields in Belgium and Germany have been steadily decreasing through 2019, entering for the first time into negative territory around June of 2019. After that, bond yields fluctuated around zero through the end of 2021, when they started to increase, largely driven by higher energy prices and, relatedly, an exceptionally high rate of inflation. The increase in bond yields was further accelerated in 2022 by the ECB announcements that it would end its monetary policy of Quantitative Easing and raise interest

[2] German bonds yields available at: https://www.bundesbank.de/en/statistics/money-and-capital-markets/interest-rates-and-yields/daily-yields-of-current-federal-securities-772220.
Belgian bonds yields available at: https://stat.nbb.be/

rates for the first time since 2011. In 2023, bond yields have reached their maximum level since 2013.

FIGURE 1: HISTORICAL RISK-FREE RATE YIELDS



Source and notes: Brattle analysis of German and Belgian Central Banks data on 10-Y government bond yields in Germany and Belgium.

In Table 2, below, we calculate the applicable risk-free rate by taking the one-year weighted average yield of Belgian and German 10-year government bonds as of the measurement date. Over the one-year period ending on 31 December 2023, yields were 3.11% on average in Belgium, and 2.46% on average in Germany; taking the weighted average between the two gives us a risk-free rate of 2.95%, which we apply to the WACC for the next regulatory period.

TABLE 2: RISK-FREE RATE CALCULATION

German RFR weight	[1]	25%		
Belgian RFR weight	[2]	75%		
		German 10 YR [A]	Belgian 10 YR [B]	RFR 10 YR [C]
Average Period				
1 YR Average	[3]	2.46	3.11	2.95

Notes and sources:
[A]: Average over the period 01/01/2023-31/12/2023 based on German Central Bank data.
[B]: Average over the period 01/01/2023-31/12/2023 based on Belgian Central Bank data.
[C]: [A]x[1]+[B]x[2]
[1],[2]: Assumed in line with VREG 2021-2024 WACC decision.

III. Equity Risk Premium

VREG's methodology calculates the ERP based on a historical time-series of the excess return of stocks over long-term bonds for the Eurozone economies published by Dimson, Marsh and Staunton (DMS), which is one of the most widely used sources for long-run excess returns.[3]

In more detail, VREG has determined to calculate the ERP based on the average of the long-term arithmetic and geometric means of the realized ERPs in Eurozone countries, weighted using the current capitalization of each country's stock market. The methodology reflects an estimate of the ERP in the very long run, and notably excludes countries outside of the Eurozone. This is reasonable, because an investor in a regulated Belgian company is more likely to be diversified over the same currency zone, rather than to incur additional currency risks by diversifying within Europe but outside of the Eurozone.[4] Weighting based on the

[3] To mention a few examples, DMS data are considered by energy regulators in Italy (ARERA, Annex to Consultation Document 308/2021/R/com, 15 July 2021, p.4), the Netherlands (D. Harris, L. Figurelli, The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs, 7 April 2021, p. 8), and France (CRE, Évaluation du taux de remuneration des gestionnaires de réseaux d'électricité et de gaz naturel en France, November 2015, p. 74-76).

[4] Note that the relevant geographic scope for the calculation of the ERP should reflect the geographic portfolio diversification for an investor in a regulated company in Flanders. This is different from the reasoning underlying the calculation of the risk-free rate. Under the CAPM model, the risk-free rate should reflect the return of an investment in a hypothetical zero beta asset. In this light, the risk free rate should be seen as a true risk-free rate, adequately approximated by the yield of government bonds in the lowest default risk country, which is generally considered to be Germany. In practice, however, regulators often use domestic bonds as well, so as to adequately remunerate regulatory and country risk associated to investing in a specific country.

current market-capitalization of each country reflects the idea that a typical investor would invest a larger share of his portfolio in countries with more investment opportunities.

Table 3, below, illustrates the realised ERP for individual European countries taken from the 2023 DMS report, which uses data up to and including 2022.[5] The Table reports the geometric and arithmetic means of the realized ERPs in each Eurozone country for which DMS have data, along with the average between the two. The Table further calculates the simple average (row [11]) and the weighted average (row [12]) for the Eurozone. Overall, we find that weighted average ERP for Eurozone countries, weighted using the current capitalization of each country's stock market, was 5.20%, which we apply to the WACC for the next regulatory period.

TABLE 3: DMS EUROZONE EQUITY RISK PREMIUMS

		Risk premiums relative to bonds, 1900 - 2022			
		Geometric mean	Arithmetic mean	Average	Country Market Cap (2022)
		%	%	%	EUR mln
		[A]	[B]	Average [A], [B]	[C]
Austria	[1]	3.20	20.60	11.90	127,029
Belgium	[2]	2.60	4.70	3.65	350,742
Finland	[3]	5.70	9.20	7.45	253,271
France	[4]	3.40	5.70	4.55	2,684,606
Germany	[5]	5.10	8.10	6.60	1,988,821
Ireland	[6]	2.90	4.90	3.90	94,181
Italy	[7]	3.20	6.50	4.85	528,713
Netherlands	[8]	3.60	5.90	4.75	839,927
Portugal	[9]	5.40	9.50	7.45	79,201
Spain	[10]	1.80	3.80	2.80	577,187
Average Eurozone	[11]	3.69	7.89	5.79	
Value-weighted average Eurozone	[12]	3.79	6.62	5.20	

Notes and sources:
[A][1]-[10], [B][1]-[10]: Elroy Dimson, Paul Marsh, and Mike Staunton, Credit Suisse Global Investment Returns Sourcebook 2023, Table 11.
[C]: Bloomberg data.
[11]: Average [1]-[10].
[12]: Average [1]-[10], weighted by [C].

[5] Credit Suisse Global Investment Returns Sourcebook 2023, Table 11.

We broadly agree with VREG's reliance on historical DMS data for the realized ERP. As we explained in prior reports for VREG and other regulators,[6] long-term historical data on the realized ERP is preferable to survey data and forward-looking estimates of the ERP such as the dividend growth model (DGM). Survey results tend to be highly volatile, and are influenced by the precise questions asked and the people that are asked the question. Similarly, DGM estimates of the ERP tend to be volatile and strongly dependent on the assumptions about dividend growth.

IV. Selection of the Peer Group

In the 2021-2024 Tariff Methodology, VREG estimated beta by reference to the betas of a sample of 10 listed and liquidly traded European and US energy networks.

In this report, we start considering the same candidate peers considered in 2021 by VREG. To this initial list of candidate peers we add the Belgian TSO Fluxys and the Romanian TSO Transgaz, since they are European energy networks with similar regulatory frameworks and facing similar risk as Fluvius. This gives us an initial list of 12 candidate peers.

We then apply a number of screening criteria to ensure a reliable beta estimate.

First, we check that the candidate peers earn a significant proportion of their revenues from regulated activities[7] and have an investment grade credit rating (*i.e.* a rating higher or equal to BBB-). Considering only companies who derive a majority of their revenues from regulated activities ensures that the peers face comparable risk to that of Fluvius. Similarly, excluding companies with a below investment-grade rating is reasonable, because the share prices of low-rated firms tend to be more reactive to company-specific news, which would lower the measured beta.

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[6] See *e.g.*, Dan Harris, Lucia Bazzucchi and Carlo Moretto, "The Cost of Capital for DSOs - Review of VREG's Methodology", March 2016, p. 23; Dan Harris and Lucrezio Figurelli, "The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs", April 2021, p. 11; and Dan Harris, Richard Caldwell, Lucia Bazzucchi and Francesco Lo Passo, "Review of approaches to estimate a reasonable rate of return for investments in telecoms networks in regulatory proceedings and options for EU harmonization", June 2016, section VI.D.

[7] We consider as regulated activities those for which revenues are set by regulated tariffs and not set by market competition. Energy transmission and distribution are typically regulated activities since they involve natural monopolies. Power generation is generally unregulated in European and US markets. As regards to the relevant threshold, we consider 75% to represent "a significant proportion" of revenues. We note however, that the choice of an exact threshold is not particularly important, as the only company we exclude with this screening (EDP) had less than 20% of revenues from regulated activities.

Second, we test that the stocks of the candidate peers are sufficiently liquid to ensure a reliable beta estimate. This is reasonable, because illiquid stocks tend to underestimate the true industry beta.[8] In more detail, we apply three liquidity tests. First, we test whether each candidate peer has achieved at least € 100 million in annual sales over the reference period, on the basis that firms with larger revenues are likely to have shares that are liquidly traded. Second, we test that the shares of each candidate peer are traded on at least 90% of trading days of the reference market index over the reference period used to estimate beta. Finally, we test whether the average of the daily bid-ask spread of each peer over the reference period used to estimate beta is lower than 1%.[9]

Third, we check whether any of the candidate peers was involved in substantial mergers and acquisitions (M&A) activity. Substantial M&A activity will tend to affect a firm's share price in a way that is unrelated to the systematic risk of the business. Hence, the observed beta for a firm with substantial M&A activity will tend to underestimate the true beta for a firm with the same business activity absent M&A activity. Accordingly, we would exclude firms that have been involved in 'substantial' M&A activity during the period for which data is used to calculate the beta.[10]

Application of these screening criteria led to the exclusion of four candidate peers:[11]

- EDP, because it derives most of its revenues from non-regulated activities.[12]

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[8] To understand why this is true, for example, consider a firm with a true beta of 1.0, so that the firm's true value moves exactly in line with the market. Now suppose that the firm's shares are traded only every other day. In this case, the firm's actual share price will only react to news the day after the market reacts. This will give the impression that the firm's value is not well correlated with the market, and the beta will appear to be less than one.

[9] The bid-ask spread test looks at the average difference over the period of time considered for the beta estimate between the ask price and the bid price, where the ask price refers to the lowest price at which a seller offers to sell the stock, while the bid price refers to the highest price a buyer will offer to pay. Hence the bid price is almost always lower than the ask price. If such difference is on average below 1% of the mid-price (i.e. the average between the bid and ask price) the stock is considered sufficiently liquid.

[10] We define a 'substantial' M&A activity as a transaction involving more than 30% of the average market capitalization of the firm in the thirty days preceding the transaction, and having a noticeable effect on the daily returns of the stock price. By noticeable effects we mean significant spikes in the daily returns in the weeks following the transaction, or alternatively significant and permanent increases or decreases in the volatility of the stock.

[11] Overall, the screening criteria we apply in this report are broadly in line with the criteria applied in the 2021-2024 Tariff Methodology. In more detail, in 2021, VREG's consultant Europe Economics selected peers based on three liquidity tests (bid-ask spread lower than 1%, trading at least 90% of trading days and annual sales achieving at least € 100 million). In addition Europe Economics checked that the peers were investment grade and had significant regulated activities (in terms of EBITDA share). We carried out the same tests using the same thresholds (using the share of regulated revenues instead of EBITDA share) and added the M&A test. Application of the same identical tests should have resulted in the same set of peers.

[12] In particular most of EDP's revenues derive from electricity generation and electricity & gas retail sale in the Iberian Peninsula, which are both mainly unregulated businesses. See EDP, Integrated Annual Report 2022, p. 362; EDP, Results Handout 2022, p. 19.

- National Grid, because for revenue related to regulated activities in the US we cannot distinguish between revenues related to energy transmission and distribution and revenues related to the sale of energy.
- Fluxys, because the company's stock is not liquidly traded.
- TC Pipelines, because the company was delisted in 2021.

Hence, we consider a final sample of eight companies.[13] Table 4, below, summarizes the results of our screening.[14]

TABLE 4: SUMMARY OF SELECTION OF COMPARABLE COMPANIES

		Outcome						
	Country	Rating	Regulated Revenues (%)	Annual Sales	Trading days	Bid-Ask Spread Test	M&A Test	Peer passes liquidity tests
Company Name								
SNAM	Italy	✓	✓	✓	✓	✓	✓	✓
TERNA	Italy	✓	✓	✓	✓	✓	✓	✓
REN	Portugal	✓	✓	✓	✓	✓	✓	✓
RED ELECTRICA	Spain	✓	✓	✓	✓	✓	✓	✓
ENAGAS	Spain	✓	✓	✓	✓	✓	✓	✓
NATIONAL GRID	UK	✓	✗	✓	✓	✓	✓	✗
ELIA	Belgium	✓	✓	✓	✓	✓	✓	✓
EVN	Austria	✓	✓	✓	✓	✓	✓	✓
EDP	Portugal	✓	✗	✓	✓	✓	✓	✗
TRANSGAZ	Romania	✓	✓	✓	✓	✓	✓	✓
FLUXYS	Belgium	✗	✓	✓	✓	✗	✓	✗
TC PIPELINES (delisted in 2021)	USA	✓	✓	✓	✗	-	✓	✗

Notes and sources: Brattle analysis on Bloomberg and companies balance sheet data.

V. Beta

The parameter beta measures the systematic risk of a company's stock relative to the overall market, thus reflecting the relative premium equity investors expect from investing in it. The

[13] We understand that in the 2021-2024 Tariff Methodology VREG considered a sample of 10 companies. However, while having a large number of peers may be desirable, even a small number of comparable companies are sufficient to obtain a reliable beta estimate. In practice, because only few European energy networks are publicly traded, regulatory reports on the WACC for regulated DSOs often involve a small number of peers. See e.g. Dan Harris and Lucrezio Figurelli, "The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs", April 2021.

[14] For further details please refer to Appendix A.

equity beta of a particular stock is generally estimated by regressing the individual stock's returns over the returns on a reference market index.

In the 2021-2024 Tariff Methodology, VREG estimated the asset beta for the Flemish DSOs by reference to the median asset beta of a peer group of 10 comparable companies. VREG calculated asset betas using a daily frequency and a reference period of 2 years, from January 1, 2018 to December 31, 2019. The simple OLS betas were also assessed against Dimson-adjusted betas, but tests performed showed that the Dimson adjustment was not needed for any company in the peer group.[15] This method resulted in a median asset beta of 0.39. VREG then calculated an equity beta of 0.83, obtained by applying the Hamada formula to re-lever the asset beta, and assuming a 60% gearing and 25% tax rate.[16]

In this report, we have updated VREG's previous estimate of the beta using the sample of eight comparable companies discussed in section IV above, and applying data that was available as of 31 December 2023.

A. Estimation of the Peer Group Equity and Asset Betas

In order to arrive at a robust beta estimate for the next regulatory period, we estimate the equity betas for the peer group of companies by regressing individual stocks' returns over the returns of a reference market index using daily data over a 2-year estimation window. We estimate betas using data over the period 1 January 2022-31 December 2023.

The systematic risk of each peer, as summarised in its beta parameter, must be measured against an index representing the overall market. Accordingly, to calculate market returns we use a broad European index (the Stoxx Europe 600 (SXXP)).

Our baseline regression approach is to estimate the equity beta based on the simple Ordinary Least Squares (OLS) regression. In line with the 2021-2024 Tariff methodology, we also consider the Dimson adjustment. The response of a firm's share price to new events and information may appear the day before or the day after with respect to the market index, depending on the liquidity of the firm's shares relative to the average liquidity of the market. Differences in market opening times and trading hours can also cause a lead or lag in the way that share prices react relative to the market index. These effects, which we will call "market

[15] See Europe Economics, Cost of Capital calculation for Electricity and Gas DSOs in Flanders, p. 19.

[16] The Hamada formula (sometimes referred to as the Modigliani-Miller formula) is: $Asset\ Beta = Equity\ Beta\ /\ [1 + (1 - tax\ \text{rate}) * gearing\ /\ (1 - gearing)]$.

imperfections", may mean that a beta estimated using daily returns on the firm's share and on the market index may be biased.

A standard way to account for market imperfections is to apply a so-called Dimson adjustment to the daily beta. The Dimson adjustment requires regressing a company's daily returns using the market index returns one day before (the lag) and one day after (the lead) as additional regressors. Implementation of the Dimson adjustment then requires calculating a 'Dimson beta', equal to the sum of the same-day, lead and lag coefficients. If the Dimson beta is statistically and significantly different from the OLS beta, this suggests that information about the true beta may be lost by considering only the simple OLS regression and, therefore, the Dimson beta is selected.

In this report, we consider both the simple OLS betas and the Dimson adjusted betas.

Equity betas are not comparable across companies. This is because equity betas also reflect the risk of financial leverage. As debt is added to the company, the equity will become riskier as more cash from profits goes towards paying debt in each year before dividends can be distributed to equity. With more debt, increases or decreases in a firm's profit will have a larger effect on the value of equity. Hence if two firms engage in exactly the same activity, but one firm has more debt, that firm will have a higher equity beta than the firm with less debt. To measure the relative risk of the underlying asset on a like-for-like basis it is therefore necessary to 'unlever' the equity betas, imagining that the firm is funded entirely by equity. The resulting beta is referred to as asset beta.

In line with the 2021-2024 Tariff Methodology, we calculate the asset betas by un-levering the estimated equity betas using the Hamada formula and the gearing and tax rates specific of each peer. We calculate the gearing (D/E) of each peer as of the measurement date, by taking the average of the quarterly gearing ratios obtained dividing quarterly net debt over quarterly market capitalization over the two-year reference period (i.e. 01 January 2022-31 December 2023).[17]

Consistent with the 2021-2024 Tariff Methodology, our preference is to consider 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. Accordingly, in the following discussion we focus on the median betas.

[17] Bloomberg provides the quarterly series of net debt for each peer as reported in each companies' quarterly accounts. Net debt is calculated equal to total short and long term debt minus cash or cash equivalents.

B. Discussion of Results

In Table 5, below, we report a summary of results for the individual companies' asset betas. For each peer, the Table reports the two-year daily asset betas estimated using the standard OLS regression (column [A]) as well as the two-year daily asset betas with the Dimson adjustment (column [B]). Detailed results for the equity and asset betas are provided in Appendix B.

TABLE 5: SUMMARY OF ASSET BETA ESTIMATES

		2 YR Daily Beta		
		OLS	Dimson adjustment	
		[A]	[B]	
SNAM	[1]	0.40	0.40	
TERNA	[2]	0.40	0.40	
REN	[3]	0.12	0.12	
RED ELECTRICA	[4]	0.27	0.27	
ENAGAS	[5]	0.25	0.25	
ELIA	[6]	0.42	0.66	*
EVN	[7]	0.79	0.79	
TRANSGAZ	[8]	0.28	0.28	
Average (final sample)	[9]	0.37	0.40	
Median (final sample)	[10]	0.34	0.34	

*Denotes Dimson adjustment

Overall, application of the Dimson adjustment affects the estimated beta of only one company, with no impact on the median. We find that both the median OLS beta and the median Dimson adjusted beta are equal to 0.34, and we apply this value in our calculations.

By re-levering the selected asset beta of 0.34 using the Hamada formula and applying a notional gearing (D/[D+E]) of 60% and the applicable tax rate in Flanders of 25%, we derive an equity beta of 0.72, which we apply in our WACC calculations.

C. Accounting for the Energy Transition

VREG also asked us to assess whether future developments that will affect the Flemish electricity and natural gas DSOs, may have implications for the method of calculating one or more of the financial parameters of the WACC.

One foreseeable development that is likely to affect the capital costs and the expected returns of electricity and gas DSOs relates to the so called 'energy transition'. Over the next decades, the use of electricity is expected to increase substantially, while the use of natural gas will decrease progressively. If the natural gas networks will not be re-utilised for alternative purposes – e.g. with the reconversion of the gas network to hydrogen or green gas – the energy transition may potentially lead in some cases to the phasing out of the natural gas networks before the end of their useful lives, with a potential issue of asset stranding. On the other hand, significant investments will need to be made to expand the capacity of the electricity distribution networks.

In general, the risks related to energy transition are mostly non-systematic. This implies that they should be accounted for when calculating the expected revenues and costs used to estimate tariffs. However, non-systematic risks do not affect the cost of capital parameters. Therefore, no adjustment to the WACC methodology is warranted for the remuneration of these risks.

In practice, however, some of the risks related to energy transition may be systematic. We consider that there are broadly two ways in which the energy transition could affect the beta of energy networks. *First*, expected changes in volumes (and particularly expected declines in natural gas volumes) may directly affect the systematic risk faced by energy networks, and hence affect the energy networks' beta. *Second*, significant differences in future investment requirements may create a difference in the asset betas of gas and electricity transmission and distribution networks.

Because electricity volumes are expected to increase due to the progressive electrification of several sectors, the first issue of volume risk, and the related issue of asset stranding, is only relevant for the gas distribution networks. Gas DSOs do not face short-term volume risk in Flanders, in the sense that they will not receive lower revenues if the volume of gas consumed decreases. This is because the Flemish regulatory framework provides for full coverage of volume risk.[18]

However, gas DSOs potentially face 'capacity' risk if a part of a gas distribution network is no longer needed. We find this possibility highly unlikely in the short term. Also, how much of the gas network will continue to be used in the longer term will depend on whether natural gas will be partly substituted by hydrogen and green gas. Importantly, even if there was a risk of assets being stranded, the risk of asset stranding is likely not systematic, as it relates to policy decisions that are independent of the performance of the financial market or the wider

[18] Note that the peers considered in the estimation of beta do not face volume risk either, as they are generally regulated under similar revenue cap systems.

economy.[19] Hence, we conclude that any decline in gas volume will not be correlated with the market index and should have no effect on the beta and the cost of capital of the Flemish DSOs.

With regards to investments, the large investments required by energy transition may potentially have an impact on beta. When a firm commits to investments that are large relative to the existing assets, the firm's value is more sensitive to changes in market conditions – that is, the firm will have a higher beta.[20] Financial analysts refer to this issue with the notion of operating leverage. Firms with higher investment requirements – higher operating leverage – will have higher betas. Hence, increased investment requirements for electricity networks could increase their asset beta, relative to historic asset betas.

Note that the relevant question here is not whether the investment risk is systematic or not. Investment risk has a systematic and non-systematic component, and the systematic component of the investment risk is properly measured by the parameter beta. The relevant question is whether the planned investments of electricity and gas DSOs in the Flemish Region may affect their betas differently, and differently from the network operators in the peer group.

In order to investigate this issue we have analysed the investments planned by Fluvius for the gas and electricity networks over the next regulatory period.[21] In Figure 2 and Figure 3 we

[19] For example, a regulator may decide to apply accelerated depreciation in case of the likely decommissioning of part of the gas network, or alternatively decide to maintain the residual value of the decommissioned part of the network into the overall RAB, thus protecting the investor from the risk of asset stranding. Clearly, these are regulatory policy decisions that do not correlate with the performance of the financial market.

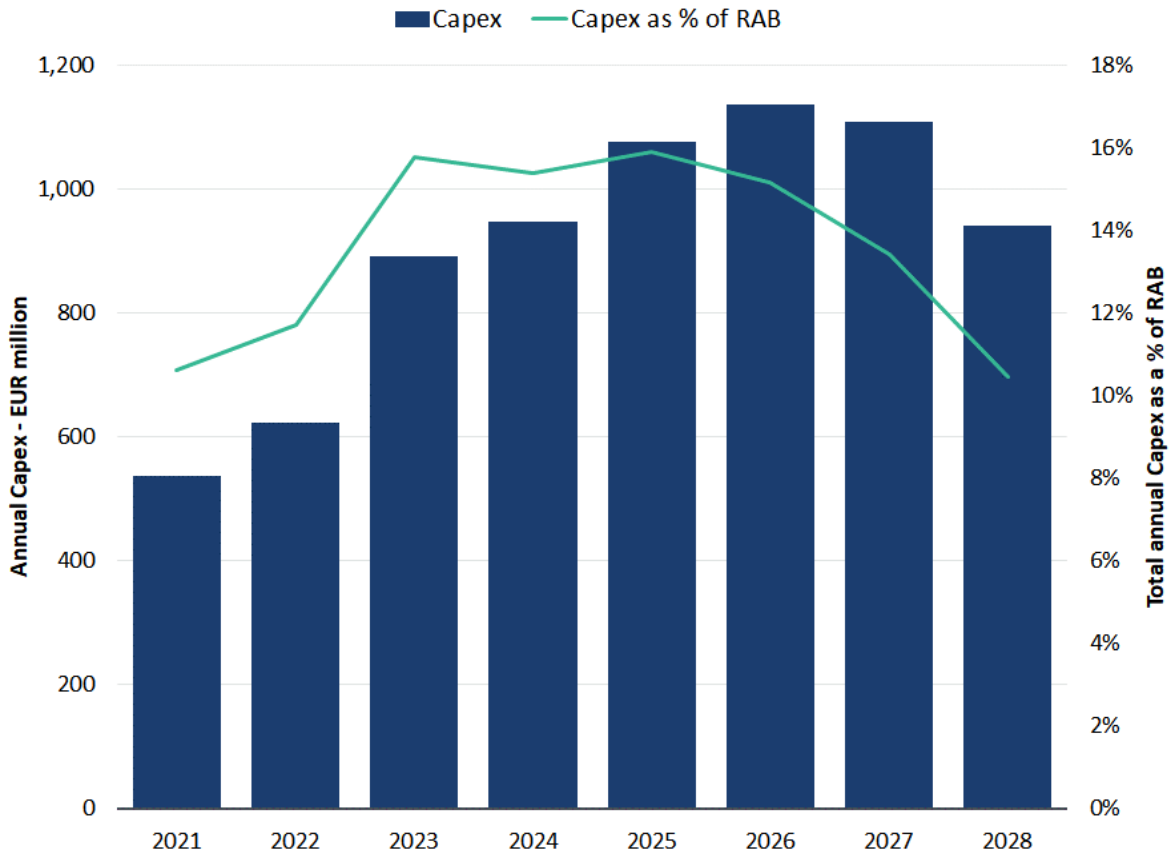
[20] To understand why, suppose that two regulated firms, A and B, both have a market value of 100 today, based on their current assets or RAB. Further, assume that the two firms face the same systematic risk on the assets, which may result in a gain or loss of 10% of market value. Hence, the value will vary between 90 and 110. Now suppose that firm B plans to increase its assets by 100. Because the new investments will be remunerated at the firm's cost of capital, the expected value of firm B is also equal to 100. This is because the firm will create additional assets with a value of 100, but needs to spend 100 to create these assets. However, assuming that the investment on the new assets has the same systematic risk of the existing assets, the expected value of the new assets will also vary by plus or minus 10%. That is, the present value of the new assets could be 110, but it could be 90. Thus, the net value of the new assets varies from -10 (in the case that the assets cost 100, but have a value of only 90) and +10 (in the case that the assets cost 100, but have a value of 110). Hence, the value of Firm B now varies between 80 (being 90 for the existing assets and -10 from the new assets) and 120 (being 110 from the existing assets and +10 from the new assets). This is variation of ±20%. The value of firm A, which has no new investments planned, varies from 90 to 110, or ±10%. Hence, the higher investment commitment of firm B increases the volatility of the firm's value.

[21] Specifically, we have considered Fluvius projected budgets for the individual DSOs' investment plans 2023-2032 as approved by VREG under conditions. Note that VREG doesn't approve these projected budgets. We further understand that Fluvius has recently submitted updated investment plans for 2024-2033, which VREG is currently assessing for approval. These updated plans indicate a slower growth of investments in the next few years.

separately report the historical and projected capital expenditures for the electricity and gas networks, expressed in nominal terms (vertical blue bars). The two Figures further show 'Capex intensity', that is capital expenditures expressed as a share of the RAB, also expressed in nominal terms, at the beginning of the year (the solid light blue line).

With respect to electricity, in Figure 2 we observe that annual investments in the electricity network are expected to increase, from about € 500-600 million in 2021-2022 to about € 1.1 billion in 2025-2027. However, capital intensity will remain relatively stable, increasing to about 16% of the RAB in 2023, and falling to about 10% of the RAB by 2028. With respect to gas, in Figure 3 we observe that annual investments on the gas network are relatively stable, between € 200 and € 250 million over 2021-2027 and falling to about € 100 million in 2028, with investments representing between 3% and 8% of the RAB in each year.

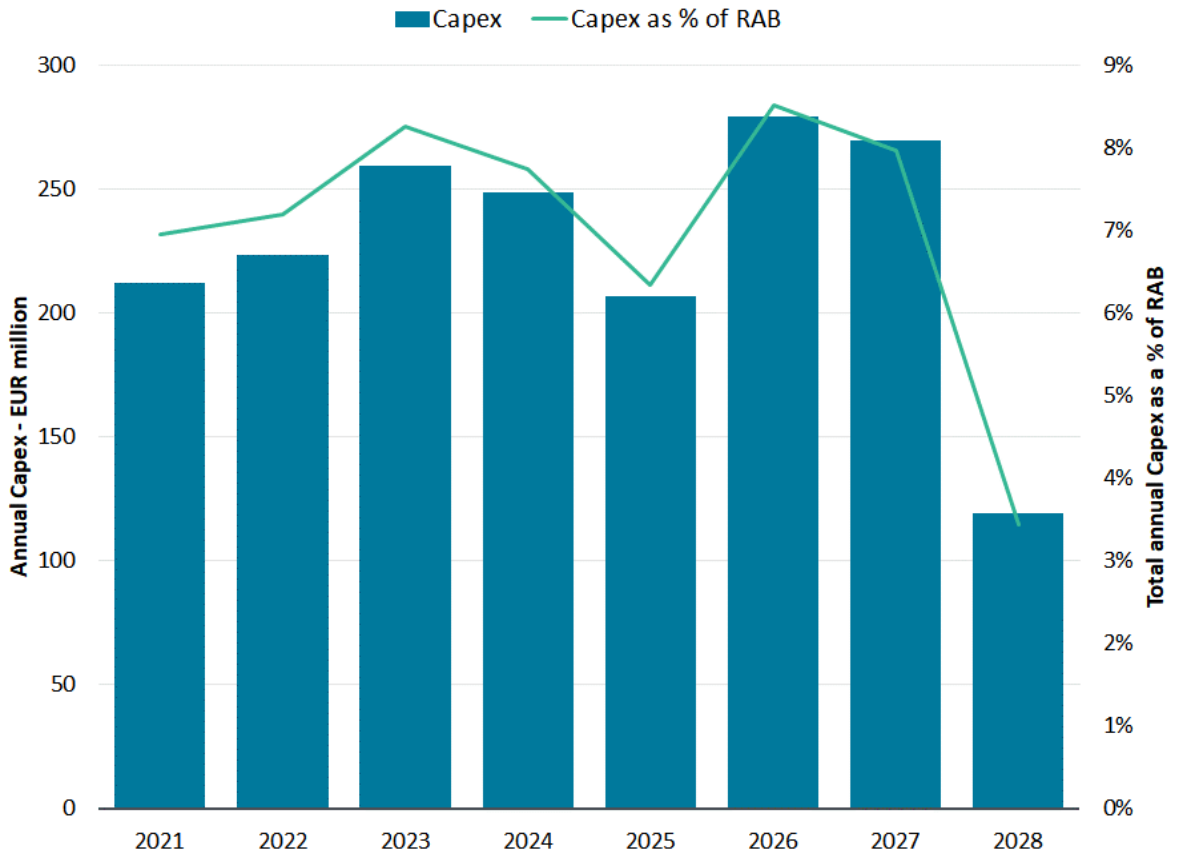
FIGURE 2: HISTORICAL AND PROJECTED FLUVIUS CAPEX PLAN – ELECTRICITY



Source: Brattle analysis on VREG data.[22]

[22] Projected values are based on the assumption of 100% realization of planned investments, although we acknowledge the realization rate might be actually lower.

FIGURE 3: HISTORICAL AND PROJECTED FLUVIUS CAPEX PLAN – GAS



Source: Brattle analysis on VREG data.[23]

In Table 6, below, we further report the Capex plans reported in the financial statements of the comparable companies used in the calculation of beta. For most companies we observe similar trends of increasing Capex plans as for the Fluvius electricity network.

TABLE 6: CAPEX PLANS OF THE COMPARABLE COMPANIES

			2021	2022	2023	2024	2025	2026	2027	2028
Capex										
Snam	[1]	M€	1,244	1,322	2,023	2,118	1,967	1,890	2,018	2,286
Terna	[2]	M€	1,521	1,757	2,163	2,210	2,387	2,515	2,151	2,152
Ren	[3]	M€	247	202	245	237	228	169	246	245
Red Electrica	[4]	M€	556	536	1,002	1,096	1,130	992	1,012	1,062
Enagas	[5]	M€	70	91	224	167	225	381	369	379
Elia	[6]	M€	1,220	1,585	2,397	2,927	3,508	3,645	4,032	2,500
Evn	[7]	M€	415	564	691	546	564	431	431	431
Transgaz	[8]	M€	989	350	350	819	819	819	500	500

Source: S&P Capital IQ, data as of 5 January 2024.

[23] Projected values are based on the assumption of 100% realization of planned investments, although we acknowledge the realization rate might be actually lower.

Overall, we find that the patterns of investments projected for Fluvius electricity and gas networks do not warrant any change in the beta. A beta uplift is only warranted in case of large Capex plans which may cause extraordinary increases in the RAB. The projected capital expenditures on Fluvius electricity distribution networks are not extraordinary, and not too dissimilar from the projected capital expenditures on the natural gas network.[24] Importantly, the projected Capex plans of the comparable companies used for the calculation of beta show similar patterns.

VI. Cost of Debt

In the 2021-2024 Tariff Methodology, VREG estimated the cost of debt as a weighted average of historic (60%) and new debt (40%), plus a 0.15% allowance to cover the costs of issuing debt, such as legal and banking commission fees.[25] Weights of new and old debt were based on a notional capital structure of an efficient DSO, the reasonableness of which VREG assessed through an analysis of future capital repayments and new long-term borrowings of the DSOs. VREG calculated the cost of old and new debt by reference to the yields of an A-rated 10-year utility index. The cost of historic debt was initially based on a 10-year average. The 10-year average was later replaced by a 7-year average, from January 1, 2010, to December 31, 2016, because increased revenues had limited the need for issuing new debt over 2017-2019.[26] The cost of new debt was based on a 1-year average, from January 1, 2019, to December 31, 2019.

A. Updating the Cost of Historic and New Debt

In general, we find the use of a notional approach reasonable and consistent with the practice of other European regulators.[27] We note, however, that VREG's current methodology applies

[24] In our report for the ACM on the WACC for the Dutch energy networks, for example, we found that the RAB of TenneT's offshore transmission network was expected to increase by a staggering compound annual growth rate of 54.98% over the period 2019-2024, compared to an annual rate of 12.11% for TenneT's onshore network, 6.54% for the Dutch electricity DSOs and 2.84% for the gas DSOs. Based on this evidence we determined that only for TenneT's offshore network an uplift to beta was warranted. See Dan Harris and Lucrezio Figurelli, "The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs", April 2021, p. 25.

[25] In 2021, VREG disaggregated its calculation into the sum of the risk-free rate plus a debt premium. This disaggregation, however, has no impact on the cost of debt.

[26] VREG, Tariefmethodologie reguleringsperiode 2021-2024 Bijlage 2 Rapport kapitaalkostenvergoeding, 8 October 2021, par. 6.2.4.4.

[27] For example, energy regulators in Germany, France and the Netherlands all consider A-rated debt to set the cost of debt. See BNETZA, BK4-21-055, 12 October 2021 for Germany. Oxera for CRE, Audit de la demande de rémunération du capital de RTE pour le TURPE 6 for France; and ACM, ACM/UIT/556461, Bijlage 3.

a notional level of gearing (D/(D+E)) of 60%, which is most consistent with an A3 rating according to Fitch and Moody's rating methodologies.[28] Accordingly, to ensure consistency with the assumed level of gearing, we recommend VREG to consider the notional cost of debt of an efficient operator with an A3 rating. Importantly, an A3 rating is consistent with the current rating of Fluvius.[29]

In order to update the calculation of cost of debt for the next regulatory period we consider the yields of the A-rated and BBB-rated 10-year utility index published by Bloomberg (respectively, the EUR Europe Utilities A+ A A- BVAL Yield Curve 10 Year, IGEEUA10 BVLI Index and the EUR Europe Utilities BBB+ BBB BBB- BVAL Yield Curve 10 Year, IGEEUB10 BVLI Index).[30]

We note that the Bloomberg A-rated utility index includes bonds issued by utilities with a rating of A+, A and A- according to S&P's rating, consistent with Moody's A1, A2 and A3 ratings. Similarly, the BBB-rated includes bonds issued by utilities with a rating of BBB+, BBB and BBB- according to S&P's rating, consistent with Moody's Baa1, Baa2 and Baa3 ratings. Therefore, taking the average of these two indices provides the best reflection of the cost of debt of an efficient operator with an A3-rating. Accordingly, we have updated the calculation of cost of debt for the next regulatory period by considering the average yield of the Bloomberg's A-rated and BBB-rated 10-year utility indices over the relevant averaging periods.

We consider a 10-year averaging period for the cost of old debt and a 1-year averaging period for the cost of new debt. As noted above, the cost of old debt for the current regulatory period was initially based on a 10-year average (2010-2019), but later replaced with a 7-year average (2010-2016), because of the limited need for new debt over 2017-2019. For the next regulatory period, however, we recommend VREG to consider a 10-year average, thus including 2017-2019 in the averaging period. Overall, removing 2017-2019 from the averaging period would be inconsistent with the notion of an efficient DSO. Facing low yields in 2017-2019, Fluvius could have refinanced its fixed rate long-term debt so as to reduce its cost of debt benefiting from the lower yields. More generally, using a simple average across ten years

[28] Fitch, 'Corporate rating criteria – Addendum Sector Navigators', May 2023, p. 204; Moody's, 'Rating Methodology Regulated Electric and Gas Networks', 13 April 2022, p. 5.

[29] Fluvius has had an A3 rating since December 2016. Before then Fluvius had an A1 rating since October 2011. See Moody's rating, available at: https://over.fluvius.be/sites/fluvius/files/2023-08/credit-opinion-fluvius-system-operator-cv-09aug2023-pbc-1374528.pdf. The A3 rating in Moody's scale corresponds to A- in S&P and Fitch scale. Similarly, an A1 rating in Moody's scale corresponds to A+ in S&P and Fitch scale.

[30] We note that in the 2021-2024 Tariff Methodology, VREG calculated the cost of debt by reference to the yields of an A-rated utility index published by Thomson Reuters. We have used the LSEG Workspace database to retrieve data on a number of utility indices published by Thomson Reuters. These indices, however, do not report a yield on all trading days and sometimes report yields during bank holidays. We are not aware of the reasons for these anomalies. Accordingly, we have recommended VREG to rely on the Bloomberg utility indices instead. Similar to the Thomson Reuters indices, the Bloomberg utility indices contain bonds issued by utilities with an average maturity of about 10 year and a rating within the specified set. Importantly, the Bloomberg indices report a yield for all trading days.

is already generous, because the DSO can always lower its cost of debt below the average by refinancing its debt when interest rates fall.

In Table 7, below, we report the 1-year and 10-year average of the daily yields for the Bloomberg's A-rated and BBB-rated 10-year utility index.[31] The table shows that the 1-year average yield as of 31 December 2023 was equal to 3.55% for the A-rated index and 4.01% for the BBB-rated index, resulting in an average between the two of 3.78%. Similarly, the 10-year average yield was equal to 1.46% for the A-rated index and 1.71% for the BBB-rated index, resulting in an average of 1.58%. We apply these values in our calculation of the cost of new debt and historic debt, respectively.

TABLE 7: 1-YEAR AND 10-YEAR AVERAGE YIELD OF THE A-RATED AND BBB-RATED UTILITY INDEX

		A-rated utility index	BBB-rated utility index	Average Yield
		[A]	[B]	[C]
1-Year Average (New Debt)	[1]	3.55	4.01	3.78
10-Year Average (Old Debt)	[2]	1.46	1.71	1.58

Notes and sources: Brattle analysis on Bloomberg data.
[1][A],[B]: Averages calculated over the period 01/01/2023-31/12/2023.
[2][A],[B]: Averages calculated over the period 01/01/2014-31/12/2023.
[C]: Average([A]-[B]).

B. Updating the Weight of Historic and New Debt

A key input into the calculation of the cost of debt for the Flemish DSOs is the weight on historic and new debt. In the 2021-2024 Tariff Methodology VREG assigned a 60% weight on historic debt and a 40% weight on new debt VREG based the weighting on a notional capital structure of an efficient DSO who finances itself through financial debt with a maturity of 10 years. VREG also tested the reasonableness of this weighting through an analysis of future capital repayments and new long-term borrowings.

In general, the use of a notional capital structure of an efficient DSO is reasonable and consistent with the practice of other energy regulators.[32] In practice, in the case of Fluvius it is also desirable that the weights of historic and new debt broadly reflect the expected

[31] The 1-year average goes from 01 January 2023 to 31 December 2023, while the 10-year average goes from 01 January 2014 to 31 December 2023.

[32] This is the case for example in France, Italy and the UK, to mention a few. CRE, Délibération de la Commission de régulation de l'ènergie du 21 janvier 2021 (TURBE 6 HTA-BT). ARERA, TIWACC 2022-2027. Ofgem, RIIO-ED: Final Determinations Finance Annex, November 2022.

structure of Fluvius' funding over the next regulatory period. Accordingly, we have assessed the reasonableness of VREG's approach analysing the time profile of Fluvius's outstanding long term debt and projections of the financing needs for Fluvius over the next regulatory period 2025-2028 (data provided by the VREG).

In Table 8, below, we report the time profile of Fluvius' outstanding long term debt. In particular, the table reports total outstanding debt as of the end of 2023 (row [1]), and for each of the following years the portion of 2023 debt that has not expired (rows [2]-[6]).[33] Overall, by 2028 about 31% of Fluvius long term debt outstanding will expire. The analysis implies that, if Fluvius were to refinance all of its long term debt outstanding, by 2028 about 31% of Fluvius debt would be 'new' debt. Similarly, the share of new debt would be 7% in 2025, 14% in 2026 and 21% in 2027. This would support an average weight for new debt of at least 18% over the next regulatory period.

TABLE 8: TIME PROFILE OF FLUVIUS OUTSTANDING DEBT

		Outstanding debt			Outstanding debt (share of 2023 debt)		
		Total € mln	Gas € mln	Electricity € mln	Total %	Gas %	Electricity %
31/12/2023	[1]	8,488	3,109	4,702	100%	100%	100%
31/12/2024	[2]	8,285	3,037	4,593	98%	98%	98%
31/12/2025	[3]	7,885	2,894	4,376	93%	93%	93%
31/12/2026	[4]	7,289	2,704	4,002	86%	87%	85%
31/12/2027	[5]	6,704	2,634	3,541	79%	85%	75%
31/12/2028	[6]	5,814	2,146	3,227	69%	69%	69%

Source: Brattle analysis on VREG data. Total includes also debt issuances for other activities.

However, the time profile of Fluvius outstanding long term debt alone is not sufficient to assess the reasonableness of the appropriate weights for historic and new debt. In addition to refinancing its expiring debt, Fluvius may be required to issue additional debt to finance significant upcoming investments. To investigate this issue, we have analyzed Fluvius' cash flow needs, as set out in VREG's financial model of Fluvius.

The model calculates cash flow needs as the difference between cash flows from operations plus additional equity injections minus capital expenditure and expiring debt. Hence, we calculated the share of new long term debt in each year over the next regulatory period over total debt based on the ratio between:

[33] The table considers outstanding debt as of 31 October 2023 to approximate outstanding debt at the end of 2023.

- Cumulated debt in each year that was issued after December 2023, equal to the sum of:
  - Debt issued to replace expiring existing debt.
  - Debt issued to cover additional cash needs.
- Total outstanding debt in each year.

In our calculations we have considered different scenarios in which the financing needs are financed through a combination of equity and debt.[34] Overall, our analysis indicates that the share of new debt over the next regulatory period (2025-2028) will range between 27% and 33%, depending on the share of financing through additional equity injections. The share of new debt over the next regulatory period will be higher for the electricity DSOs and lower for the gas DSOs. These results suggest that the weight for new debt over the next regulatory period should be lower than the 40% weight selected in the 2021-2024 Tariff Methodology.

Based on the above calculations, we find that using a notional weight for new debt of 35% is reasonable and we apply this value in our calculation of the cost of debt for the next regulatory period.[35]

C. Conclusions on the Cost of Debt for the Next Regulatory Period

Table 9, below, summarizes our calculation of the cost of debt of Fluvius for the next regulatory period. Using the average yields of the Bloomberg A-rated and BBB-rated utility Indices as of 31 December 2023 and a 65%-35% weighting of historic and new debt we derive a cost of debt of 2.35%, which increases to 2.50% when we add 15 bps to account for the costs of issuing debt.

[34] In particular, we have considered scenarios in which additional equity injections cover between 0% and 50% of the financing needs in each year.

[35] A 35% weighting is fully consistent with VREG's notional approach which considers an efficient DSO who finances itself through financial debt with a maturity of 10 years. In fact, taking into account that VREG determines the cost of existing and new financial debt using data with a time difference of 2 years, a 35% notional weight for a regulatory period of four years is consistent with a 10% share of new financial debt issued in each year.

TABLE 9: COST OF DEBT CALCULATION

		Cost of Debt [A]	Weight [B]
Cost of New Debt	[1]	3.78	35%
Cost of Old Debt	[2]	1.58	65%
Weighted Average	[3]	2.35	
Issuance cost	[4]	0.15	
Cost of Debt	[5]	**2.50**	

Notes and sources:
[1][A],[2][A]: See Table 7.
[3]: [1][B]x[1][A]+[2][B]x[2][A]
[4]: Assumed in line with VREG 2021-2024 methodology
[5]: [3]+[4]

VII. Gearing and Tax

In line with the 2021-2024 Tariff Methodology, we consider a notional gearing (D/(D+E)) of 60%. A 60% gearing is consistent with the gearing of an efficient operator with an A3 rating, as evidenced by Fitch and Moody's rating methodologies.[36]

In calculating the cost of capital for the Flemish DSOs we also apply the statutory tax rate of 25% to calculate the equity beta and the nominal pre-tax WACC.

VIII. Conclusions of the WACC for the Flemish DSOs

In Table 10 we report our calculation of the nominal pre-tax WACC for the Flemish DSOs for the next regulatory period starting in 2025, using data as of 31 December 2023. Overall, based on the parameter values identified above we derive a value of 5.1%. Consistent with VREG's

[36] Fitch, 'Corporate rating criteria – Addendum Sector Navigators', May 2023, p. 204; Moody's, 'Rating Methodology Regulated Electric and Gas Networks', 13 April 2022, p. 5.

2021-2024 tariff methodology we round the individual WACC parameters at the closest second decimal point and the overall WACC to the closest first decimal point.

TABLE 10: SUMMARY OF WACC ESTIMATES

			VREG 2021-2024 [A]	Brattle December 2023 estimate 2025-2028 [B]
Risk-free Rate	[1]	See note	0.09%	2.95%
ERP	[2]	See note	4.81%	5.20%
Asset beta	[3]	See note	0.39	0.34
Equity beta	[4]	[3]x(1+(1-[6])x[10])	0.83	0.72
Cost of equity	[5]	[1]+[4]x[2]	4.08%	6.69%
Tax rate	[6]	See note	25.00%	25.00%
Pre-tax cost of equity	[7]	[5]/(1-[6])	5.44%	8.92%
Cost of debt	[8]	See note	2.14%	2.50%
Gearing (D/A)	[9]	See note	60.00%	60.00%
Notional Gearing (D/E)	[10]	[9]/(1-[9])	150.00%	150.00%
Nominal WACC (Vanilla)	[11]	(1-[9])x[5]/+[9]x[8]	2.9%	4.2%
Nominal WACC (pre-tax)	**[12]**	**(1-[9])x[5]/(1-[6])+[9]x[8]**	**3.5%**	**5.1%**

Notes and sources:
[A]: VREG, Tariefmethodologie reguleringsperiode 2021-2024 Bijlage 2 Rapport kapitaalkostenvergoeding, 8 October 2021.
[B][1]: 1-year average of German and Belgian 10-year government bond yields weighted 0.25 and 0.75 respectively.
[B][2]: DMS average Equity Risk Premium as of end 2022 for the Eurozone countries weighted by market capitalization.
[B][3]: Median of the 2-year daily beta of a sample of comparable companies as of 31/12/2023.
[B][6]: Corporate tax rate in Belgium (2023), KPMG.
[B][8]: Weighted average of the 10-year (65%) and one-year (35%) average yields of the Bloomberg A-rated and BBB-rated utility Indices plus 0.15%.
[B][9]: Assumed in line with VREG 2021-2024 WACC decision.

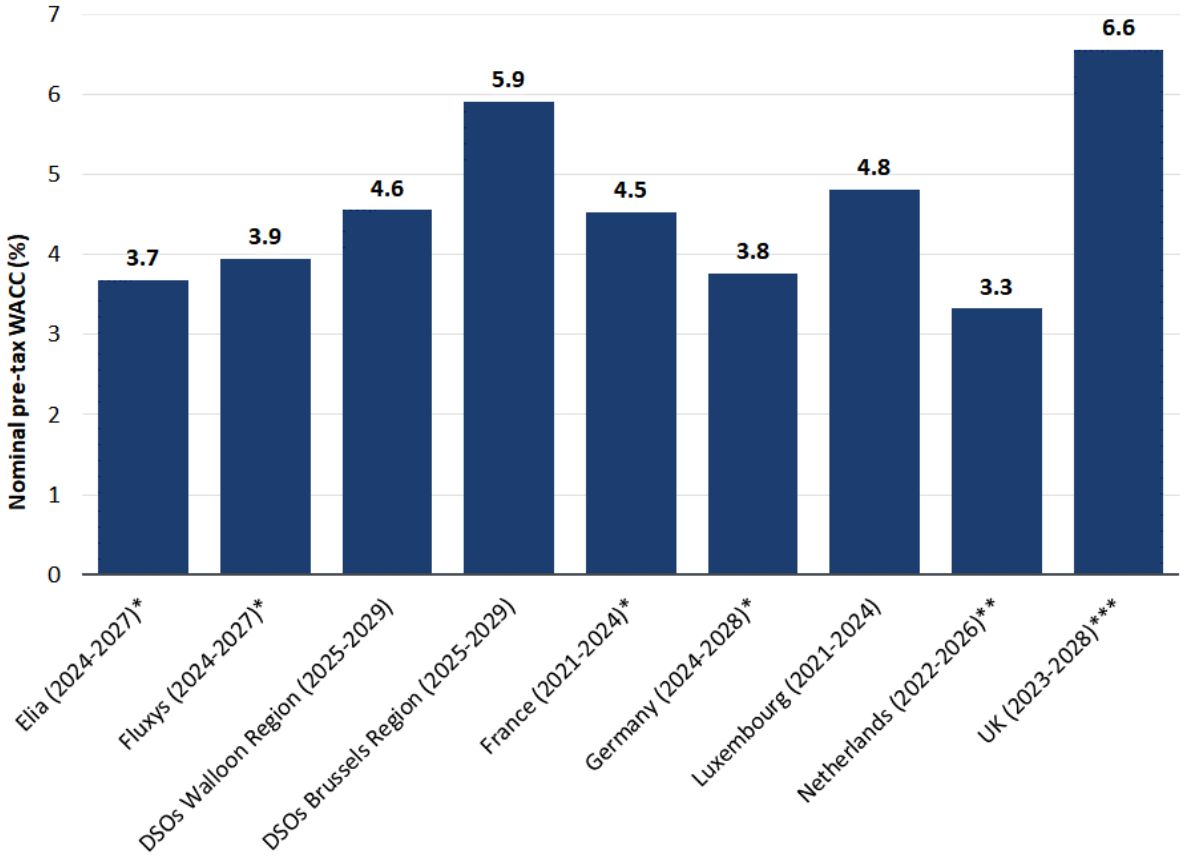
IX. WACC Benchmarking

VREG has also asked us to benchmark the value of the WACC for the Flemish DSOs against the values approved by regulators in similar countries such as France, Germany, Luxembourg, Netherlands and United Kingdom, as well as in the latest WACC decisions for the Belgian TSOs Elia and Fluxys and the Belgian DSOs in the Walloon and Brussels regions.

In Figure 4, below, we compare our proposed WACC for the Flemish DSOs (5.1%) with the value of the WACC approved for the DSOs in a set of benchmark countries plus the value of

the WACC selected for Elia,[37] Fluxys and the Belgian DSOs in the Walloon and Brussels regions. In order to make the comparison like-for-like, we have re-expressed all WACCs in nominal pre-tax terms applying a common tax rate of 25% and gearing of 60%. In all cases, we calculate the applicable equity beta by re-levering the asset beta selected by the regulator using a notional gearing of 60%. In cases in which the regulator only sets the cost of equity (Elia, Fluxys, Germany and France), we have calculated the WACC setting the cost of debt equal to the value of the cost of debt we have calculated for VREG (2.50%). For the UK, which sets a real vanilla WACC, we have also added inflation using the Fisher formula and CPIH inflation values embedded in Ofgem estimates.

FIGURE 4: NOMINAL PRE-TAX WACC BENCHMARK (25% TAX, 60% GEARING)



Notes and sources: Brattle analysis on National Authorities data.

*Companies/countries without cost of debt inclusion in the regulated return in which we set the cost of debt equal to the value of the cost of debt we have calculated for VREG (2.50%).

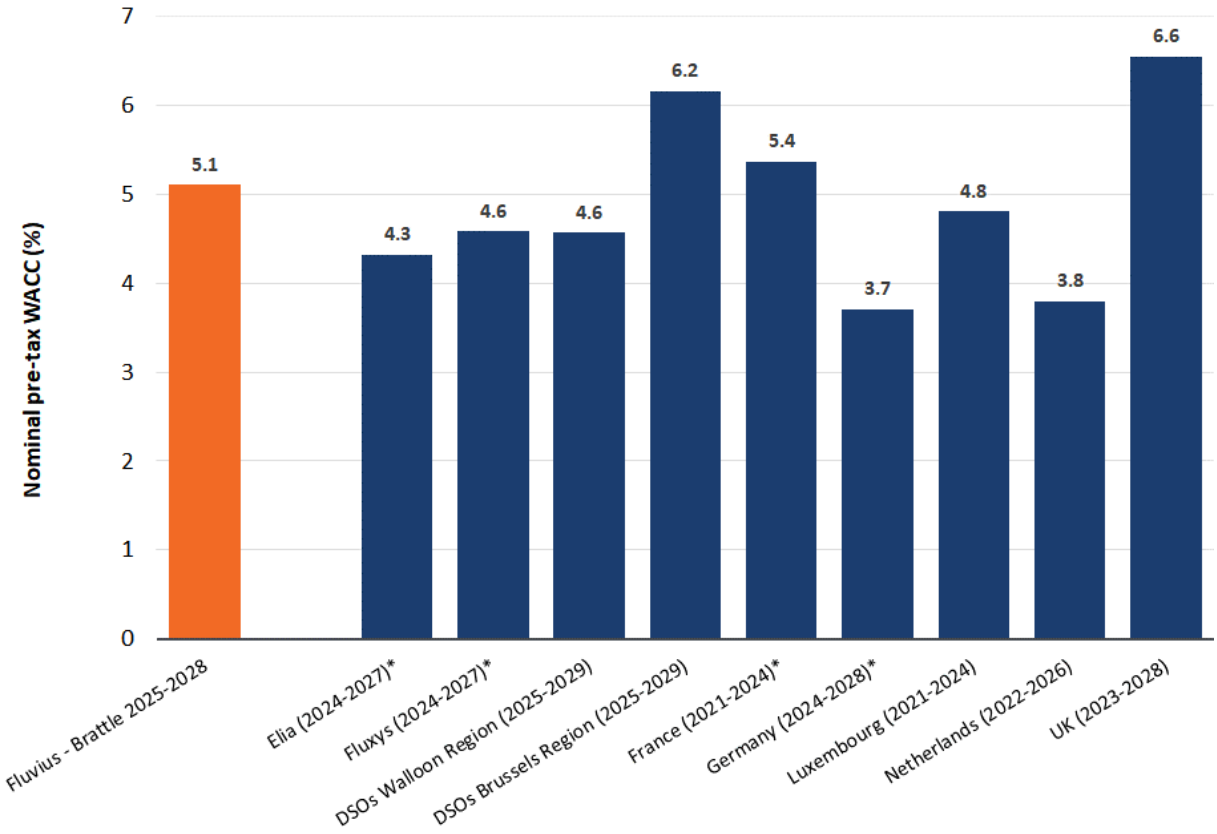
**The Dutch regulator adopts a WACC which changes in each year of the regulatory period based on the cost of debt. We considered the WACC applied in 2022.

[37] In our calculation for Elia we consider the latest decision approved by the regulator CREG in June 2022. We note, that in November 2023 CREG has opened a public consultation proposing to adopt a 'soft' cap and floor mechanism for the calculation of the RFR, with a floor at 1.68% and a cap at 2.87%. In case the average yield overcomes 2.87% the RFR will be increased above 2.87% only for investments realized after 2021, while for existing RAB as of January 2022 only half of the yield above 2.87% will be included in the RFR. The consultation is still ongoing at the time of preparing this report, See https://www.creg.be/nl/openbare-raadplegingen/prd1109/12.

***We assumed a 1.87% inflation to convert the WACC from real to nominal in line with Ofgem estimates

Since the relevant decisions were taken in different years and using data from different reference periods, we have further refined our benchmarking exercise by updating each regulator's estimate of the risk-free rate as of a common measurement date of 31 December 2023. Unsurprisingly, these adjustments result in an increase of the WACC in most cases, with the exception of Germany where it decreases. Such result is driven by the use of a 10-year average in calculating the risk-free rate. Figure 5 shows our results.

FIGURE 5: NOMINAL PRE-TAX WACC BENCHMARK (25% TAX, 60% GEARING AND RISK-FREE RATE CALCULATED AS OF 31 DECEMBER 2023 ON EACH COUNTRY GOVERNMENT BOND YIELDS)



Notes and sources: Brattle analysis on National Authorities data.

*Companies/countries without cost of debt inclusion in the regulated return in which we set the cost of debt equal to the value of the cost of debt we have calculated for VREG (2.50%).

**For DSOs in the Brussels region we update the risk-free rate both for the calculation of the cost of equity and cost of debt, because the regulator calculates the cost of debt as the sum of a risk-free rate plus debt premium.

Overall, our benchmark analysis shows that the WACC calculated for VREG, equal to 5.1%, is within the range of the WACCs adopted by other energy regulators in comparable countries expressed on a like for like basis. Additionally, the lower WACC we observe in some countries is driven, at least in part, by the use of longer averaging periods in the calculation of the risk-free rate, as is the case for Germany and the Walloon Region, which consider a 10-year averaging period, and the Netherlands, which considers a 3-year period.

X. Infra-period WACC Update

VREG has further asked us to advice on whether an infra-period adjustment to the WACC may be warranted to better reflect current market conditions.

In general, the use of regulatory periods of several years is reasonable, as it provides a stable and predictable regulatory environment able to incentivize investments in the medium and long term. In addition, tariff decisions often involve lengthy and costly consultations, which make the use of multi-year regulatory periods preferable to annual decisions.

In periods of high market volatility and structural changes, however, setting a WACC over a period of several years may result in misalignments between the WACC measured ahead of the tariff decision and the firms' actual WACC during the regulatory period, determined using current market data. In extreme cases, the misalignment may be so large as to cause financeability issues, for example if interest rates have risen significantly whereas the regulatory WACC has not.[38]

On balance, we believe that reducing the risk of a large misalignment between current market conditions and the regulatory WACC is more important than ensuring relatively stable tariffs and the potential costs of a WACC update. Furthermore, the implementation of an infra-period WACC update does not necessarily need a consultation or involve high costs. The Italian energy regulator ARERA, for example, has selected an automatic annual WACC update with a trigger mechanism, in which the WACC is only updated if an objective measure of certain WACC parameters changes more than a given threshold.[39] In setting guidelines on the calculation of the WACC for telecoms regulators, the European Commission has also recommended an annual update of the WACC, demanding the body of European regulators (BEREC) to publish an annual report on the relevant WACC parameters.

There are several ways VREG may attempt to reduce the risk of a large misalignment. First, it could divide the regulatory period in two regulatory sub-periods and update some of the

[38] On the other hand, there is no risk for financeability and incentives to invest when interest rates fall and the regulatory WACC does not. However, even in these circumstances, re-aligning the regulatory WACC to the firms' actual WACC during the regulatory period would provide appropriate incentives for the DSOs to reduce their financing costs and ultimately result in more reasonable tariffs for end users.

[39] In more detail, each year ARERA calculates the WACC which results from updating the risk-free rate, the country risk premium, the nominal cost of debt and the embed inflation parameter and compares it to the current WACC. If the updated WACC differs from the current WACC by more than 50 basis points, then ARERA updates the WACC by updating the parameters above as well as the expected inflation rate and the forward premium.

relevant WACC parameters mid-term. Alternatively, it could implement an automatic, possibly annual, update with a trigger mechanism, whereas the WACC would be updated only if certain pre-defined conditions are met. Finally, VREG could opt for a mandatory annual update of some or all of the WACC parameters. The exact implementation of these different approaches will address the risk of misalignments at different degrees, and will involve different levels of involvement by VREG and stakeholders.

In practice, large misalignments are generally driven by movements in interest rates affecting the risk-free rate and the cost of debt. Accordingly, in order to adequately prevent misalignments and minimize costs, we would recommend VREG to implement an annual WACC update of the risk-free rate and the cost of debt. As regards the potential application of a trigger mechanism, we see no advantage in applying one for the Flemish DSOs because under the current framework tariffs would be calculated annually even without the annual update.[40]

In this scenario, VREG would need to proceed as follows in each year:

1. Calculate the updated risk-free rate based on the 1-year average of the Belgian and German 10-year government bond yields.[41]

2. Calculate the updated cost of debt based on the 1-year and 10-year averages of the Bloomberg's A-rated and BBB-rated 10-year utility indices (*i.e.*, the EUR Europe Utilities A+ A A- BVAL Yield Curve 10 Year, IGEEUA10 BVLI Index and the EUR Europe Utilities BBB+ BBB BBB- BVAL Yield Curve 10 Year, IGEEUB10 BVLI Index).[42]

3. Calculate the updated WACC using the updated risk-free rate and cost of debt.

Finally, we note that if VREG decides to apply an annual WACC update, then it should also consider the implications of such an update for the share of historic and new debt. In Section VI.B we explained that using a notional weight of 35% for new debt for the next four-year regulatory period would be reasonable. However, because with the annual update the cost of debt would be calculated using more recent data and would apply to one year only, a lower

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[40] The advantage of applying a trigger mechanism is that tariffs are only updated if the trigger is activated. But if tariffs need to be updated annually anyway then there is no real advantage in applying a trigger mechanism.

[41] As explained in section II, VREG could use data on yields of 10-year government bonds from German and Belgian Central Banks. German bonds yields available at: https://www.bundesbank.de/en/statistics/money-and-capital-markets/interest-rates-and-yields/daily-yields-of-current-federal-securities-772220

Belgian bonds yields available at: https://stat.nbb.be/

[42] Note that the update should involve both the historic and new debt. This is because at each annual update some of the old debt considered in the previous year will have expired and some new debt will have been issued, thus accruing to the stock of existing debt at the time of the annual update. Accordingly, the cost of both historic and new debt should be updated accounting for one additional year of data on debt yields.

weight to new debt should be assigned in each year. In this regard, a 20% weighting for new debt would be consistent with an average expected share of new debt of 35% over the next regulatory period and estimating the cost of debt using data from *t-2*.[43]

XI. Financeability

VREG has also asked us to advise on an approach for VREG to carry out 'financeability' tests for the next regulatory period, and in particular to analyze VREG's financial model of Fluvius and the financeability indicators calculated therein.

Financeability refers to the ability of the regulated company to maintain an adequate credit rating by meeting certain financial metrics with respect to its existing and new debt. Having determined the appropriate level of the WACC, regulators may test whether the allowed revenues and cash flows under the proposed WACC are sufficient for the regulated company to maintain its credit rating and finance its activities at the rate considered in the WACC. Regulators generally assess financeability by reference to the financial ratios used by rating agencies in their rating decisions.

If the regulated company does not maintain the required levels of financial ratios for a specified credit rating, its cost of debt will increase. This could limit the ability of the regulated company to finance investments and/or refinance its debt, potentially leading to losses and financial distress. It is therefore important for a regulator to assess financeability, to ensure that the level of the WACC considered allows the regulated company to operate in a stable and sustainable manner.

However, regulators must also avoid creating a 'moral hazard', whereby the regulated company might take on excessive debt, knowing that the regulator will increase the allowed return if any problems with financeability materialize. Accordingly, in calculating the WACC, regulators often consider the notional level of gearing and credit rating of an efficient operator, to provide incentives for the regulated company not to take on too much debt. Financeability tests thus consist in checking whether the allowed revenues and cash flows under the proposed regulatory framework are sufficient to allow the regulated company to maintain an adequate credit rating.

[43] We understand that VREG would set the WACC for 2025 using data from 2023 and the WACC for 2026 using data from 2024.

Below, we first assess VREG's current approach to financeability. We then discuss the results of some financeability tests we have run to assess the reasonableness of VREG's WACC methodology.

A. Assessment of VREG's Current Approach to Financeability

As explained above, in calculating the cost of debt and the WACC for the Flemish DSOs, VREG considers a notional capital structure for an efficient DSO. VREG thus considers a target level of gearing of 60% to re-lever the asset beta and calculate the WACC, and calculates the cost of debt by reference to the average yield between an A-rated and a BBB-rated utility index. A gearing of 60% is also consistent with an A3 rating according to Moody's rating methodology for electricity and gas networks.

VREG's financial model of Fluvius applies Moody's rating methodology for regulated electric and gas networks. Therefore, we have reviewed Moody's rating methodology, as updated in April 2022,[44] and assessed whether VREG's financial model implements the methodology correctly.

According to Moody's rating methodology for regulated electric and gas networks, the credit rating of a regulated DSO is determined based on five general factors:

1. Regulatory environment and asset ownership model;
2. Scale and complexity of capital program;
3. Financial policy;
4. Leverage and coverage; and
5. Structural considerations and sources of rating uplift from creditor protection.

The first four factors are used to determine a preliminary or baseline rating. The fifth factor is applied only to increase the rating if the network benefits from structural enhancements due to its corporate structure, its regulatory license or its financing arrangements.

As illustrated in Figure 6, below, the first four factors are further divided into a number of sub-factors, and each sub-factor is assigned a weight. The preliminary rating is thus calculated by first assigning a score to each sub-factor and then using the sub-factors' weights to arrive at an overall rating.[45]

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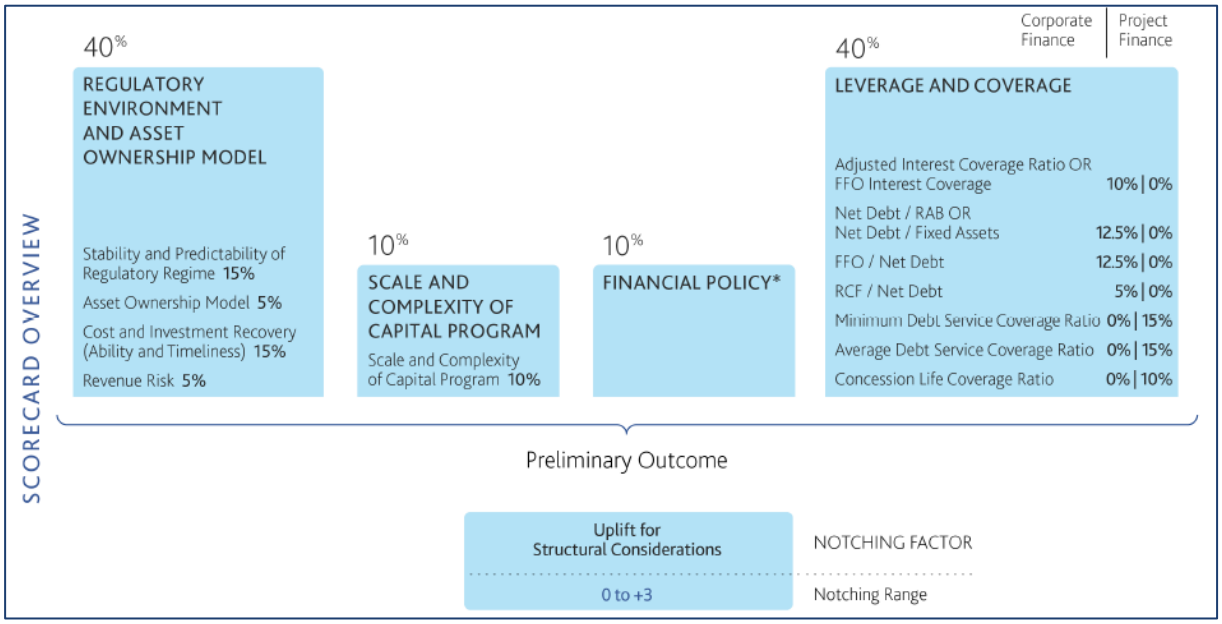
[44] Moody's, Rating Methodology - Regulated Electric and Gas Networks, 13 April 2022.

[45] The overall grid-indicated rating is calculated based on a system mapping the sub-factor scores into numeric values, and then reconverting the weighted average of the numeric values into an overall score. Moody's rating methodology - Regulated Electric and Gas Networks, 13 April 2022, pp. 3-8.

FIGURE 6: MOODY'S RATING GRID



Source: Moody's rating methodology - Regulated Electric and Gas Networks, 13 April 2022, p. 3.

While the first three categories refer to a subjective assessment made by Moody's, the leverage and coverage ratios – which are the financial ratios used to assess financeability – are objective indicators that the regulator itself can monitor based on financial model projections.

In more detail, as illustrated in Figure 6, Moody's assigns a 40% weighting to leverage and coverage ratios, considering the following four metrics:

1. **Interest coverage ratios (10% weight):** Moody's considers alternatively the Adjusted Interest Coverage Ratio (AICR) or the Funds From Operations (FFO) Interest Coverage Ratio.[46] These ratios reflect the ability of a network to meet its interest expense obligations using funds from operations.[47]

[46] The AICR adjusts FFO by an amount of money – the Capital Charges – that the regulator includes within current revenue at the expense or benefit of future revenue.

[47] We understand that Moody's uses the AICR for regulated networks to allow comparability of such ratio across regulatory frameworks ("We use the AICR for regulated networks where allowed revenues/tariffs are determined using a 'building block approach' and where the components of allowed revenues/tariffs are routinely published and can be verified by an independent source, which in most cases is the regulatory authority. The AICR adjusts FFO by an amount of money (Capital Charges) that the regulator includes within current revenue at the expense or benefit of future revenue. The removal of capital charges from FFO allows for greater comparability of interest coverage for networks within a regulatory regime and for networks across different regulatory regimes", see Moody's rating methodology - Regulated Electric and Gas Networks, 13 April 2022, p. 12). However, this is not the case for Fluvius, for which Moody's has considered the FFO interest coverage ratio (see Moody's, Fluvius System Operator CV Credit Opinion, 9 August 2023, p. 2).

2. **Leverage ratios (12.5% weight):** Moody's considers alternatively the ratio of Net Debt/RAB or the ratio of Net Debt/Fixed Assets. Leverage ratios are indicators of debt serviceability and financial leverage;

3. **Debt coverage ratio (12.5% weight):** the ratio of FFO/Net Debt is useful in comparing the ability of a network to generate sufficient cash flow to cover future debt repayments;

4. **Retained Cash Flow/Net Debt (5% weight)**: the ratio of Retained Cash Flows/Net Debt is an indicator of a network's cash generation (before working capital movements and capital expenditures, and after dividend payments) relative to its net debt (total debt minus cash and cash equivalents). While the other metrics are specifically focused on debt and debt repayments, the (RCF/Net Debt) allows to measure the sustainability of dividend payout policies.

As regards to the fifth factor, Moody's takes into account factors that can provide creditors meaningful protection against losses. In the case of Fluvius, Moody's has applied a two-notch uplift to the baseline rating of Fluvius, from Baa1 to A3, considering the implicit debt guarantee due to public ownership by the Flemish municipalities.[48] In other words, Moody's assumes that in the event of a near-default, the Flemish municipalities would step in to support Fluvius and maintain payments to its creditors.

We have reviewed VREG's financial model and its implementation of Moody's rating methodology. VREG's financial model of Fluvius contains a bottom up calculation of Fluvius' rating which replicates closely the methodology of the calculation of Moody's scorecard outcome in each year of the 2023-2032 forecast period.

In particular, the financial model calculates for each year the leverage and coverage ratios used by Moody's. It then assumes that throughout the period considered in the financial model:

- Fluvius will maintain the scores assigned by Moody's in the last rating decision (August 2023) for each of the other three factors of the baseline rating.
- Moody's will continue to apply a two-notch uplift to the baseline rating of Fluvius due to the public ownership by the Flemish municipalities.

Our review of VREG's financial model confirms that VREG has implemented Moody's methodology correctly.

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[48] In particular, Moody's has taken into account (i) the credit rating of the Community of Flanders (Aa3, stable outlook), (ii) the strong probability of public support in case of financial distress, and (iii) the high level of default dependence – that is, the degree of exposure to common drivers of credit quality – between Fluvius and the Flemish municipalities. Baa1 and A3 correspond respectively to BBB+ and A- in S&P and Fitch rating scales.

Overall, we find VREG's approach to financeability to be reasonable, for two main reasons. *First*, using a notional capital structure of a network operator with an A3 rating is consistent with the approach of other European regulators.[49] Importantly, the current rating of Fluvius (A3, stable outlook) is in line with the rating VREG assumes in calculating the WACC.[50] *Second*, assessing financeability by applying Moody's rating methodology is also reasonable and consistent with common regulatory practice. VREG's approach has also the merit of being transparent and easy to implement.

B. Results of Financeability Tests

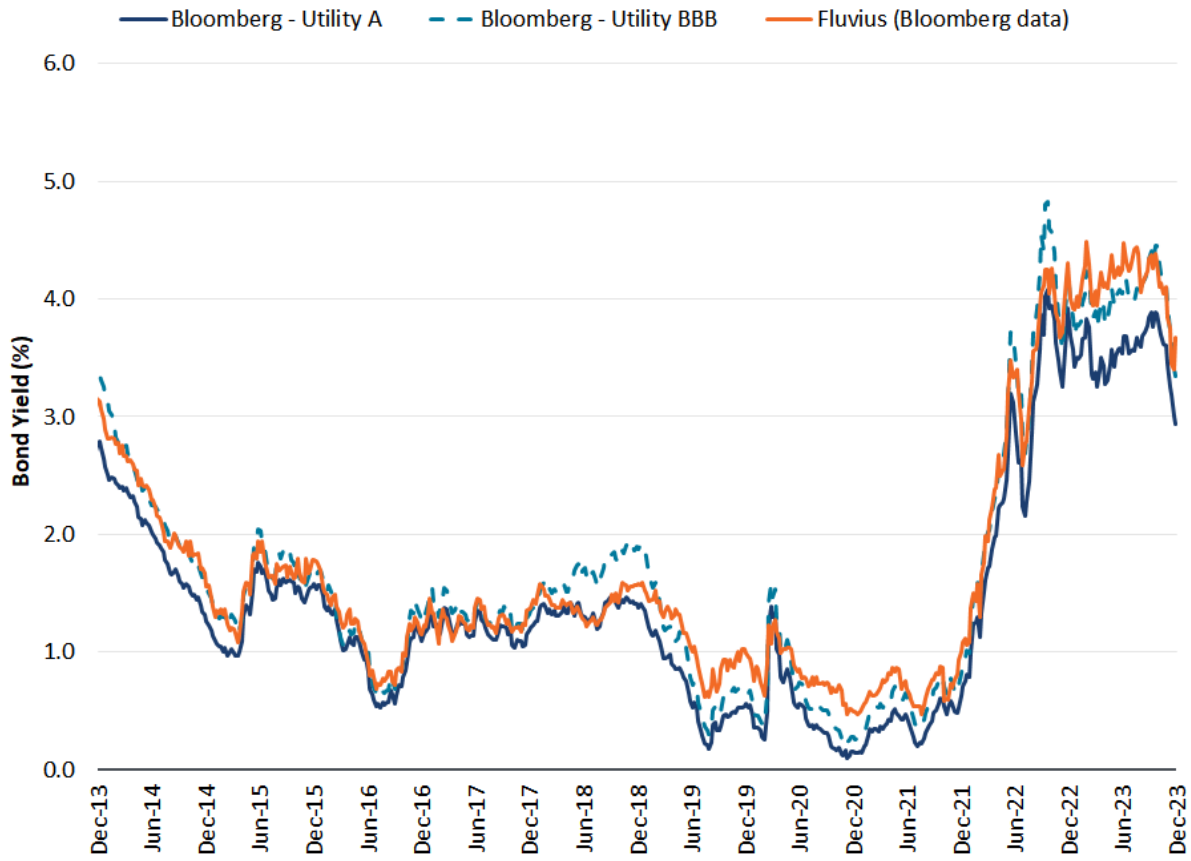
As noted above, we calculate the cost of debt by reference to the average yield of Bloomberg A-rated and BBB-rated utility indices. However, the resulting cost of debt may be lower than the rate at which Fluvius may actually finance its investments. Accordingly, to assess the financeability of Fluvius we have also analysed the evolution of a set of bonds issued by Fluvius and traded in the secondary market with an average maturity of about 10-years. Details on the analysis of Fluvius bonds are provided in Appendix C.

In Figure 7, below, we report the evolution of the yields of the A-rated utility index, the BBB-rated utility index, and the index of Fluvius bonds over the past ten years. Overall, the three indices follow a very similar pattern, with the A-rated index always slightly lower than both the BBB-rated index and the index of Fluvius bonds. Over the past 10 years, all three indices have steadily fallen from 2013 onwards, reaching lows below 1% toward the beginning of 2019. After that, yields have remained relatively stable until the beginning of 2022, when the surge of inflation and the war in Ukraine, compounded by the later ECB announcements to end the QE program and increase rates caused an abrupt increase in yields. By mid-2022, yields had reached again their 2013 levels. Yields then continued to increase in the second half of 2022 and remained relatively stable over the first half of 2023, falling slightly in the last few months of 2023.

[49] For example, energy regulators in Germany, France and Belgium all consider a notional gearing of 60% and credit rating of A. See BNETZA, BK4-21-055, 12 October 2021 for Germany. Oxera for CRE, Audit de la demande de rémunération du capital de RTE pour le TURPE 6 for France; and CREG, Arrêté (Z)1109/11, 30 juin 2022 for Belgium.

[50] Moody's, Fluvius System Operator CV Credit Opinion, 9 August 2023. A3 in Moody's rating scale corresponds to A- in S&P and Fitch rating scales.

FIGURE 7: COMPARISON OF FLUVIUS AND EUROPEAN UTILITIES INDEX COST OF DEBT



Source: Brattle analysis on Bloomberg data.

We note that the average yield on Fluvius bonds has been generally higher than the yield of the A-rated utility index and more in line with the yields of the BBB-rated index. This may seem at odds with Fluvius' rating, which was A1 until December 2016 and remained stable at A3 from December 2016 onwards.[51] However, the lower yield of the A-rated index may reflect the higher liquidity and trading frequency of the bonds considered in the A-rated index, which could lower the yield relative to the Fluvius bonds. Hence, there is a risk that Fluvius' actual cost of new debt will be closer to a BBB-rated bond, while VREG assumes a cost of debt associated with the average between an A rating and a BBB rating.

[51] For the history of Fluvius rating see https://over.fluvius.be/en/investor-relations/ratings-and-bonds/ratings?app-refresh=1704887512873. Fluvius A3 rating was confirmed for the last time in August 2023 (see Moody's, available at: https://over.fluvius.be/sites/fluvius/files/2023-08/credit-opinion-fluvius-system-operator-cv-09aug2023-pbc-1374528.pdf). A1 and A3 ratings in Moody's scale correspond to A+ and A- ratings in S&P and Fitch scales.

In general, a regulated company's ability to maintain an adequate rating will depend on its overall capital remuneration, including cost of equity and cost of debt. In this section, however, we focus primarily on the cost of debt methodology for testing financeability. Specifically, we have investigated whether financeability problems would arise for Fluvius if it actually had a cost of debt in line with a BBB rating, while earning a WACC consistent with the average between an A rating and a BBB rating. This is because VREG applies a notional approach to the cost of debt calculation, so that differences between the actual cost of debt of Fluvius and the estimated notional cost of debt may cause financeability issues. In contrast, there is no 'actual', observable cost of equity against which to compare the estimated cost of equity. Accordingly, we have analyzed the financial ratios of Fluvius using VREG's financial model under three alternative scenarios:

- In the baseline scenario, we consider our current estimate of the WACC and an actual cost of debt for Fluvius in line with the new cost of debt estimate in the WACC;
- In a first alternative scenario we consider our current estimate of the WACC, but an actual cost of new debt for Fluvius in line with a BBB rating;
- Finally, we consider a second alternative scenario with a higher value of the WACC based on an assumed BBB-rated cost of debt, and an actual cost of new debt for Fluvius in line with a BBB rating.

Overall, our analysis of the three scenarios indicates that Fluvius would maintain an adequate credit rating even if the actual cost of new debt was in line with a BBB rating, but the WACC is estimated based on the average between A-rated and BBB-rated index yields.[52] We note that our calculations are based on a non-final version of VREG's financial model of Fluvius. The results, however, are quite robust and the conclusions we reach are unlikely to be affected by further refinements.

The finding that the cost of debt methodology does not raise financeability issues also implies that the estimated cost of equity and overall WACC level do not raise financeability issues. Hence, we conclude that the risk that an error in the estimate of the cost of debt for Fluvius could raise financeability issues is small.

[52] In all three scenarios we assume that 100% of the cash needs are financed issuing new debt. More reasonable assumptions in which part of the cash needs are financed through additional equity injections result in improved financial metrics and thus lower risk of a credit downgrade.

Appendix A: Results of the Liquidity and M&A Tests

TABLE 11: RESULTS OF THE LIQUIDITY AND M&A TESTS

		Values					Outcome						
	Country	Rating	Regulated Revenues (%)	Annual Sales (€ mln)	Trading days	Bid-Ask Spread Test	Rating	Regulated Revenues (%)	Annual Sales	Trading days	Bid-Ask Spread Test	M&A Test	Peer passes liquidity tests
	[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]
Company Name													
SNAM	Italy	BBB+	77.4%	2,742	99.4%	0.10%	✓	✓	✓	✓	✓	✓	✓
TERNA	Italy	BBB+	85.8%	2,542	99.4%	0.11%	✓	✓	✓	✓	✓	✓	✓
REN	Portugal	BBB	99.6%	586	99.8%	0.22%	✓	✓	✓	✓	✓	✓	✓
RED ELECTRICA	Spain	A-	81.7%	1,646	99.8%	0.08%	✓	✓	✓	✓	✓	✓	✓
ENAGAS	Spain	BBB	99.3%	957	99.8%	0.07%	✓	✓	✓	✓	✓	✓	✓
NATIONAL GRID	UK	BBB+	39.9%	20,059	100.0%	0.04%	✓	✗	✓	✓	✓	✓	✗
ELIA	Belgium	BBB	98.9%	3,813	99.8%	0.11%	✓	✓	✓	✓	✓	✓	✓
EVN	Austria	A+	78.0%	3,169	99.2%	0.33%	✓	✓	✓	✓	✓	✓	✓
EDP	Portugal	BBB	16.4%	3,378	99.8%	0.06%	✓	✗	✓	✓	✓	✓	✗
TRANSGAZ	Romania	BBB-	100.0%	1,430	97.3%	0.58%	✓	✓	✓	✓	✓	✓	✓
FLUXYS	Belgium	-	97.7%	892	99.8%	1.46%	✗	✓	✓	✓	✗	✓	✗
TC PIPELINES (delisted in 2021)	USA	BBB+	100.0%	399	0.0%	-	✓	✓	✓	✗	✓	✓	✗

Notes and sources: Brattle analysis on Bloomberg and companies balance sheet data. Regulated Revenues shares and annual sales data displayed refer to 2022 but we checked that requirements are met in each year of beta estimation interval. The other tests' values refer to the whole 2-year period considered for beta estimation (i.*e.*, from 1 January 2022 to 31 December 2023.

Appendix B: Equity and Asset Betas

TABLE 12: OLS 2-YEAR DAILY EQUITY AND ASSET BETAS

			OLS 2Y Daily			
			Equity Beta [A]	Gearing (D/E) [B]	Tax Rate [C]	Asset Beta [D]
SNAM	Italy	[1]	0.65	81.7%	24.0%	0.40
TERNA	Italy	[2]	0.58	60.2%	24.0%	0.40
REN	Portugal	[3]	0.23	120.3%	21.0%	0.12
RED ELECTRICA	Spain	[4]	0.40	64.1%	25.0%	0.27
ENAGAS	Spain	[5]	0.41	82.9%	25.0%	0.25
ELIA	Belgium	[6]	0.57	48.4%	25.0%	0.42
EVN	Austria	[7]	0.97	30.2%	25.0%	0.79
TRANSGAZ	Romania	[8]	0.40	53.3%	16.0%	0.28
Median (final sample)		**[9]**	**0.49**			**0.34**

Notes and Sources: Brattle analysis on Bloomberg data as of 31 December 2023.

TABLE 13: 2-YEAR EQUITY AND ASSET BETAS WITH DIMSON ADJUSTMENT

			Dimson adjustment			
			Equity Beta [A]	Gearing (D/E) [B]	Tax Rate [C]	Asset Beta [D]
SNAM	Italy	[1]	0.65	81.7%	24.0%	0.40
TERNA	Italy	[2]	0.58	60.2%	24.0%	0.40
REN	Portugal	[3]	0.23	120.3%	21.0%	0.12
RED ELECTRICA	Spain	[4]	0.40	64.1%	25.0%	0.27
ENAGAS	Spain	[5]	0.41	82.9%	25.0%	0.25
ELIA	Belgium	[6]	0.90	48.4%	25.0%	0.66
EVN	Austria	[7]	0.97	30.2%	25.0%	0.79
TRANSGAZ	Romania	[8]	0.40	53.3%	16.0%	0.28
Median (final sample)		**[9]**	**0.50**			**0.34**

Notes and Sources: Brattle analysis on Bloomberg data as of 31 December 2023.

Appendix C: Analysis of Fluvius Bonds

Table 14 below shows the list of Fluvius bonds considered.

TABLE 14: LIST OF FLUVIUS BONDS CONSIDERED

	Company	Ticker	Currency	Moody's Rating at issuance	Issuance date	Maturity date	Amount issued (€ '000)
	[A]	[B]	[C]	[D]	[E]	[F]	[G]
[1]	FLUVIUS System Operator CVBA	ZK9896042 Corp	EUR	A3	28/06/2023	28/06/2027	261,864
[2]	FLUVIUS System Operator CVBA	ZK4653356 Corp	EUR	A3	09/05/2023	09/05/2033	766,871
[3]	FLUVIUS System Operator CVBA	BX4548455 Corp	EUR	A3	06/07/2022	06/07/2032	508,655
[4]	FLUVIUS System Operator CVBA	AN8822297 Corp	EUR	A3	23/06/2017	23/06/2025	223,942
[5]	FLUVIUS System Operator CVBA	EK6283213 Corp	EUR	A1	04/12/2014	04/12/2026	494,984
[6]	FLUVIUS System Operator CVBA	EK2459296 Corp	EUR	A1	07/05/2014	07/05/2029	765,595
[7]	FLUVIUS System Operator CVBA	BP9628697 Corp	EUR	A3	14/06/2021	14/06/2028	606,110
[8]	FLUVIUS System Operator CVBA	EJ2647521 Corp	EUR	A1	10/07/2012	10/07/2032	165,461
[9]	FLUVIUS System Operator CVBA	BM7555675 Corp	EUR	A3	02/12/2020	02/12/2030	725,604
[10]	FLUVIUS System Operator CVBA	EJ8654372 Corp	EUR	A1	09/10/2013	09/10/2023	675,565
[11]	FLUVIUS System Operator CVBA	EJ8986469 Corp	EUR	A1	30/10/2013	30/10/2023	344,253
[12]	FLUVIUS System Operator CVBA	BS4766603 Corp	EUR	A3	24/11/2021	24/11/2031	671,742
[13]	FLUVIUS System Operator CVBA	EK5622676 Corp	EUR	A1	29/10/2014	29/10/2029	318,345
[14]	FLUVIUS System Operator CVBA	EK5461281 Corp	EUR	A1	27/10/2014	27/10/2044	215,977
[15]	FLUVIUS System Operator CVBA	BO8682599 Corp	EUR	A3	08/04/2021	08/04/2033	119,216
[16]	FLUVIUS System Operator CVBA	BZ9899015 Corp	EUR	A3	07/11/2022	07/11/2034	50,110
[17]	FLUVIUS System Operator CVBA	EJ5969617 Corp	EUR	A1	28/03/2013	28/03/2033	26,284
[18]	FLUVIUS System Operator CVBA	ZN0831844 Corp	EUR	A3	15/11/2022	15/11/2034	15,577
[19]	FLUVIUS System Operator CVBA	EJ5969369 Corp	EUR	A1	28/03/2013	28/03/2028	69,878
[20]	FLUVIUS System Operator CVBA	ZN6808515 Corp	EUR	A3	15/12/2022	15/12/2042	37,098
[21]	FLUVIUS System Operator CVBA	BZ0579855 Corp	EUR	A3	20/09/2022	20/09/2034	49,899
[22]	FLUVIUS System Operator CVBA	BZ8448160 Corp	EUR	A3	28/10/2022	28/10/2042	49,693
[23]	FLUVIUS System Operator CVBA	EK5463501 Corp	EUR	A1	27/10/2014	27/10/2034	120,693
[24]	FLUVIUS System Operator CVBA	EJ4579532 Corp	EUR	A1	30/11/2012	30/11/2022	650,080
[25]	FLUVIUS System Operator CVBA	EI4825226 Corp	EUR	A1	30/12/2010	30/12/2020	225,471
[26]	FLUVIUS System Operator CVBA	EI8603751 Corp	EUR	A1	08/11/2011	08/11/2021	689,090
[27]	FLUVIUS System Operator CVBA	EI2728067 Corp	EUR	A1	23/06/2010	23/06/2017	183,825
[28]	Infrax CVBA	EJ4559757 Corp	EUR	A1	06/12/2012	06/12/2015	17,487
[29]	Infrax CVBA	EJ4559609 Corp	EUR	A1	30/11/2012	30/11/2015	13,652
[30]	Infrax CVBA	EJ4559708 Corp	EUR	A1	30/11/2012	30/11/2017	32,829
[31]	FLUVIUS System Operator CVBA	ZI8420864 Corp	EUR	A3	18/09/2023	18/03/2031	534,615

Source: Brattle analysis on Bloomberg data.

We identified all bonds issued either by Fluvius System Operator, Infrax CVBA or Eandis System operator. No bonds were attributed to Eandis System operator by Bloomberg. However, some of the Fluvius bonds likely refer to Eandis. Then we considered the weekly yield to maturity (field "YLD_YTM_MID") of each bond in the last ten years. For the purpose of calculating the average debt yield of Fluvius in each week we selected only bonds with residual maturity comprised between 5 and 20 years. Finally we checked that the average maturity of bonds considered was close to ten years in each week considered.

Table 15 displays – for each week – the arithmetic average of bond yields (column [C]), the average maturity (column [B]) and the number of bonds considered (column [A]).

TABLE 15: AVERAGE YIELD AND MATURITY OF FLUVIUS BONDS

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
29/12/2023	15	9.9	3.68
22/12/2023	16	10.0	3.40
15/12/2023	16	10.0	3.44
08/12/2023	16	10.0	3.75
01/12/2023	16	10.0	3.84
24/11/2023	16	10.1	4.10
17/11/2023	16	10.1	4.05
10/11/2023	16	10.1	4.14
03/11/2023	16	10.1	4.10
27/10/2023	16	10.1	4.32
20/10/2023	16	10.2	4.38
13/10/2023	16	10.2	4.26
06/10/2023	16	10.2	4.38
29/09/2023	16	10.2	4.34
22/09/2023	16	10.2	4.24
15/09/2023	16	10.2	4.18
08/09/2023	15	10.4	4.13
01/09/2023	15	10.5	4.06
25/08/2023	15	10.5	4.39
18/08/2023	15	10.5	4.44
11/08/2023	15	10.5	4.42
04/08/2023	15	10.5	4.36
28/07/2023	14	10.6	4.26
21/07/2023	14	10.6	4.24
14/07/2023	15	10.6	4.32
07/07/2023	15	10.6	4.48
30/06/2023	15	10.6	4.25
23/06/2023	15	10.7	4.20
16/06/2023	16	10.3	4.27
09/06/2023	16	10.3	4.20
02/06/2023	16	10.4	4.18
26/05/2023	16	10.4	4.37
19/05/2023	16	10.4	4.28

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
12/05/2023	15	10.5	4.09
05/05/2023	15	10.5	4.14
28/04/2023	14	10.6	4.10
21/04/2023	14	10.6	4.22
14/04/2023	15	10.5	4.13
07/04/2023	14	10.6	3.95
31/03/2023	15	10.3	4.07
24/03/2023	15	10.3	3.95
17/03/2023	15	10.3	3.98
10/03/2023	16	10.3	4.29
03/03/2023	16	10.3	4.49
24/02/2023	16	10.3	4.29
17/02/2023	16	10.3	4.17
10/02/2023	16	10.4	4.08
03/02/2023	16	10.4	3.93
27/01/2023	16	10.4	4.02
20/01/2023	16	10.4	3.91
13/01/2023	16	10.4	3.92
06/01/2023	15	10.5	4.00
30/12/2022	15	10.5	4.31
23/12/2022	15	10.5	4.18
16/12/2022	14	9.9	3.91
09/12/2022	14	9.9	3.71
02/12/2022	14	9.9	3.67
25/11/2022	14	9.9	3.80
18/11/2022	14	10.0	3.89
11/11/2022	14	10.0	4.05
04/11/2022	14	10.0	4.26
28/10/2022	12	9.0	4.05
21/10/2022	11	8.8	4.25
14/10/2022	11	8.8	4.25
07/10/2022	11	8.8	4.11
30/09/2022	11	8.8	4.06
23/09/2022	11	8.8	3.92
16/09/2022	11	8.9	3.62
09/09/2022	10	8.6	3.57
02/09/2022	10	8.6	3.55
26/08/2022	10	8.6	3.30

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
19/08/2022	10	8.6	3.08
12/08/2022	10	8.6	2.79
05/08/2022	10	8.7	2.77
29/07/2022	10	8.7	2.58
22/07/2022	10	8.7	2.97
15/07/2022	10	8.7	3.21
08/07/2022	10	8.7	3.40
01/07/2022	10	8.8	3.34
24/06/2022	9	8.6	3.33
17/06/2022	9	8.7	3.48
10/06/2022	9	8.7	3.19
03/06/2022	9	8.7	2.84
27/05/2022	9	8.7	2.56
20/05/2022	9	8.7	2.54
13/05/2022	9	8.8	2.50
06/05/2022	9	8.8	2.68
29/04/2022	9	8.8	2.40
22/04/2022	9	8.8	2.38
15/04/2022	9	8.8	2.22
08/04/2022	9	8.9	2.12
01/04/2022	9	8.9	1.94
25/03/2022	9	8.9	1.98
18/03/2022	9	8.9	1.76
11/03/2022	9	8.9	1.66
04/03/2022	9	8.9	1.30
25/02/2022	9	9.0	1.58
18/02/2022	9	9.0	1.44
11/02/2022	9	9.0	1.50
04/02/2022	10	9.2	1.38
28/01/2022	9	9.0	1.08
21/01/2022	9	9.1	1.06
14/01/2022	10	9.2	1.11
07/01/2022	10	9.2	1.08
31/12/2021	10	9.3	1.00
24/12/2021	10	9.3	0.93
17/12/2021	10	9.3	0.81
10/12/2021	11	8.9	0.77
03/12/2021	10	8.8	0.70

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
26/11/2021	11	9.0	0.73
19/11/2021	10	8.8	0.60
12/11/2021	9	8.7	0.61
05/11/2021	9	8.7	0.58
29/10/2021	10	8.9	0.86
22/10/2021	10	9.0	0.87
15/10/2021	10	9.0	0.81
08/10/2021	10	9.0	0.82
01/10/2021	10	9.0	0.76
24/09/2021	10	9.0	0.76
17/09/2021	10	9.1	0.71
10/09/2021	10	9.1	0.69
03/09/2021	9	8.9	0.60
27/08/2021	9	8.9	0.55
20/08/2021	9	8.9	0.48
13/08/2021	10	9.1	0.54
06/08/2021	10	9.2	0.54
30/07/2021	10	9.2	0.54
23/07/2021	9	9.0	0.54
16/07/2021	9	9.0	0.60
09/07/2021	9	9.0	0.64
02/07/2021	9	9.1	0.69
25/06/2021	9	9.1	0.76
18/06/2021	9	9.1	0.72
11/06/2021	9	9.1	0.68
04/06/2021	9	9.6	0.85
28/05/2021	9	9.6	0.87
21/05/2021	8	9.4	0.83
14/05/2021	8	9.5	0.87
07/05/2021	8	9.5	0.82
30/04/2021	8	9.5	0.83
23/04/2021	8	9.5	0.77
16/04/2021	8	9.5	0.74
09/04/2021	9	9.7	0.76
02/04/2021	9	9.8	0.69
26/03/2021	8	9.5	0.68
19/03/2021	7	9.3	0.64
12/03/2021	7	9.3	0.63

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
05/03/2021	7	9.3	0.63
26/02/2021	7	9.3	0.67
19/02/2021	7	9.3	0.63
12/02/2021	8	9.6	0.58
05/02/2021	8	9.6	0.56
29/01/2021	8	9.7	0.51
22/01/2021	8	9.7	0.50
15/01/2021	8	9.7	0.47
08/01/2021	8	9.7	0.49
01/01/2021	8	9.7	0.49
25/12/2020	8	9.8	0.52
18/12/2020	8	9.8	0.51
11/12/2020	8	9.8	0.47
04/12/2020	8	9.8	0.56
27/11/2020	8	9.8	0.55
20/11/2020	7	9.8	0.68
13/11/2020	7	9.8	0.72
06/11/2020	7	9.9	0.66
30/10/2020	7	9.9	0.66
23/10/2020	7	9.9	0.70
16/10/2020	7	9.9	0.66
09/10/2020	7	9.9	0.74
02/10/2020	7	10.0	0.74
25/09/2020	6	9.7	0.72
18/09/2020	6	9.7	0.74
11/09/2020	6	9.7	0.73
04/09/2020	6	9.7	0.73
28/08/2020	6	9.7	0.79
21/08/2020	6	9.8	0.72
14/08/2020	6	9.8	0.78
07/08/2020	6	9.8	0.72
31/07/2020	6	9.8	0.71
24/07/2020	6	9.8	0.77
17/07/2020	6	9.9	0.79
10/07/2020	6	9.9	0.78
03/07/2020	6	9.9	0.85
26/06/2020	7	9.2	0.83
19/06/2020	7	9.2	0.86

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
12/06/2020	7	9.3	0.89
05/06/2020	7	9.3	1.03
29/05/2020	7	9.3	1.04
22/05/2020	7	9.3	1.03
15/05/2020	7	9.3	1.03
08/05/2020	6	10.1	1.03
01/05/2020	6	10.1	0.99
24/04/2020	6	10.1	1.11
17/04/2020	7	9.4	1.18
10/04/2020	7	9.4	1.27
03/04/2020	7	9.4	1.22
27/03/2020	7	9.5	1.07
20/03/2020	7	9.5	1.23
13/03/2020	8	9.9	0.91
06/03/2020	8	9.9	0.64
28/02/2020	8	9.9	0.71
21/02/2020	7	9.6	0.75
14/02/2020	8	9.9	0.85
07/02/2020	8	10.0	0.88
31/01/2020	7	9.6	0.75
24/01/2020	7	9.6	0.84
17/01/2020	7	9.7	0.95
10/01/2020	7	9.7	0.96
03/01/2020	8	10.1	0.99
27/12/2019	8	10.1	1.03
20/12/2019	8	10.1	1.03
13/12/2019	7	9.8	0.92
06/12/2019	8	10.1	1.00
29/11/2019	8	10.1	0.94
22/11/2019	7	9.8	0.86
15/11/2019	7	9.8	0.89
08/11/2019	7	9.9	0.94
01/11/2019	7	9.9	0.85
25/10/2019	8	10.2	0.94
18/10/2019	8	10.3	0.93
11/10/2019	8	10.3	0.86
04/10/2019	8	10.3	0.73
27/09/2019	7	10.0	0.66

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
20/09/2019	7	10.0	0.72
13/09/2019	8	10.4	0.86
06/09/2019	8	10.4	0.71
30/08/2019	8	10.4	0.62
23/08/2019	8	10.4	0.66
16/08/2019	8	10.4	0.62
09/08/2019	8	10.5	0.74
02/08/2019	8	10.5	0.78
26/07/2019	8	10.5	0.87
19/07/2019	8	10.5	0.94
12/07/2019	8	10.5	1.05
05/07/2019	8	10.5	1.00
28/06/2019	8	10.6	1.05
21/06/2019	8	10.6	1.09
14/06/2019	8	10.6	1.16
07/06/2019	8	10.6	1.16
31/05/2019	8	10.6	1.22
24/05/2019	8	10.7	1.32
17/05/2019	8	10.7	1.32
10/05/2019	8	10.7	1.37
03/05/2019	7	10.4	1.31
26/04/2019	7	10.4	1.29
19/04/2019	7	10.4	1.34
12/04/2019	7	10.4	1.38
05/04/2019	7	10.4	1.35
29/03/2019	7	10.5	1.30
22/03/2019	7	10.5	1.34
15/03/2019	7	10.5	1.43
08/03/2019	7	10.5	1.42
01/03/2019	7	10.5	1.52
22/02/2019	7	10.6	1.45
15/02/2019	7	10.6	1.45
08/02/2019	7	10.6	1.43
01/02/2019	7	10.6	1.50
25/01/2019	7	10.6	1.53
18/01/2019	7	10.7	1.59
11/01/2019	7	10.7	1.57
04/01/2019	7	10.7	1.58

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
28/12/2018	7	10.7	1.56
21/12/2018	7	10.7	1.57
14/12/2018	7	10.8	1.56
07/12/2018	7	10.8	1.55
30/11/2018	7	10.8	1.52
23/11/2018	7	10.8	1.57
16/11/2018	7	10.8	1.59
09/11/2018	7	10.8	1.59
02/11/2018	8	10.1	1.48
26/10/2018	8	10.2	1.42
19/10/2018	8	10.2	1.50
12/10/2018	9	9.6	1.44
05/10/2018	9	9.6	1.49
28/09/2018	9	9.7	1.42
21/09/2018	9	9.7	1.39
14/09/2018	9	9.7	1.38
07/09/2018	9	9.7	1.33
31/08/2018	9	9.7	1.27
24/08/2018	9	9.7	1.28
17/08/2018	9	9.8	1.23
10/08/2018	9	9.8	1.24
03/08/2018	9	9.8	1.30
27/07/2018	9	9.8	1.28
20/07/2018	9	9.8	1.25
13/07/2018	9	9.9	1.22
06/07/2018	9	9.9	1.27
29/06/2018	9	9.9	1.29
22/06/2018	9	9.9	1.31
15/06/2018	9	9.9	1.36
08/06/2018	9	10.0	1.39
01/06/2018	9	10.0	1.35
25/05/2018	9	10.0	1.33
18/05/2018	9	10.0	1.43
11/05/2018	9	10.0	1.41
04/05/2018	9	10.1	1.40
27/04/2018	9	10.1	1.42
20/04/2018	9	10.1	1.44
13/04/2018	9	10.1	1.38

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
06/04/2018	9	10.1	1.37
30/03/2018	9	10.1	1.37
23/03/2018	9	10.2	1.40
16/03/2018	9	10.2	1.40
09/03/2018	9	10.2	1.46
02/03/2018	9	10.2	1.47
23/02/2018	9	10.2	1.47
16/02/2018	9	10.3	1.53
09/02/2018	9	10.3	1.57
02/02/2018	9	10.3	1.58
26/01/2018	9	10.3	1.48
19/01/2018	9	10.3	1.41
12/01/2018	9	10.4	1.45
05/01/2018	9	10.4	1.38
29/12/2017	9	10.4	1.36
22/12/2017	9	10.4	1.35
15/12/2017	9	10.4	1.23
08/12/2017	9	10.5	1.24
01/12/2017	10	9.9	1.17
24/11/2017	10	9.9	1.21
17/11/2017	10	10.0	1.21
10/11/2017	10	10.0	1.21
03/11/2017	10	10.0	1.17
27/10/2017	10	10.0	1.20
20/10/2017	10	10.0	1.27
13/10/2017	10	10.1	1.24
06/10/2017	10	10.1	1.31
29/09/2017	10	10.1	1.32
22/09/2017	10	10.1	1.31
15/09/2017	10	10.1	1.29
08/09/2017	10	10.2	1.16
01/09/2017	10	10.2	1.21
25/08/2017	10	10.2	1.21
18/08/2017	10	10.2	1.25
11/08/2017	10	10.2	1.22
04/08/2017	10	10.3	1.30
28/07/2017	10	10.3	1.38
21/07/2017	10	10.3	1.37

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
14/07/2017	10	10.3	1.44
07/07/2017	10	10.3	1.45
30/06/2017	10	10.4	1.38
23/06/2017	10	10.4	1.21
16/06/2017	10	10.4	1.23
09/06/2017	9	10.7	1.18
02/06/2017	9	10.7	1.19
26/05/2017	9	10.7	1.24
19/05/2017	9	10.7	1.26
12/05/2017	9	10.7	1.29
05/05/2017	9	10.8	1.31
28/04/2017	9	10.8	1.22
21/04/2017	9	10.8	1.16
14/04/2017	9	10.8	1.10
07/04/2017	9	10.8	1.17
31/03/2017	9	10.9	1.23
24/03/2017	9	10.9	1.29
17/03/2017	9	10.9	1.31
10/03/2017	9	10.9	1.36
03/03/2017	9	10.9	1.25
24/02/2017	9	11.0	1.08
17/02/2017	9	11.0	1.22
10/02/2017	10	11.4	1.33
03/02/2017	9	11.0	1.33
27/01/2017	10	11.5	1.46
20/01/2017	9	11.1	1.33
13/01/2017	9	11.1	1.21
06/01/2017	9	11.1	1.23
30/12/2016	9	11.1	1.14
23/12/2016	9	11.1	1.16
16/12/2016	9	11.1	1.25
09/12/2016	9	11.2	1.30
02/12/2016	9	11.2	1.22
25/11/2016	9	11.2	1.18
18/11/2016	9	11.2	1.24
11/11/2016	10	10.6	1.13
04/11/2016	10	10.6	0.97
28/10/2016	10	10.7	0.99

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
21/10/2016	10	10.7	0.83
14/10/2016	10	10.7	0.87
07/10/2016	10	10.7	0.85
30/09/2016	10	10.7	0.72
23/09/2016	10	10.8	0.76
16/09/2016	10	10.8	0.84
09/09/2016	10	10.8	0.83
02/09/2016	10	10.8	0.78
26/08/2016	10	10.8	0.75
19/08/2016	10	10.9	0.78
12/08/2016	10	10.9	0.72
05/08/2016	10	10.9	0.74
29/07/2016	10	10.9	0.69
22/07/2016	10	10.9	0.79
15/07/2016	10	10.9	0.84
08/07/2016	10	11.0	0.80
01/07/2016	10	11.0	0.90
24/06/2016	10	11.0	1.01
17/06/2016	10	11.0	1.07
10/06/2016	10	11.0	1.10
03/06/2016	10	11.1	1.18
27/05/2016	10	11.1	1.26
20/05/2016	10	11.1	1.29
13/05/2016	10	11.1	1.24
06/05/2016	10	11.1	1.24
29/04/2016	10	11.2	1.36
22/04/2016	10	11.2	1.32
15/04/2016	10	11.2	1.25
08/04/2016	10	11.2	1.21
01/04/2016	10	11.2	1.27
25/03/2016	10	11.3	1.34
18/03/2016	10	11.3	1.38
11/03/2016	10	11.3	1.49
04/03/2016	10	11.3	1.47
26/02/2016	10	11.3	1.39
19/02/2016	10	11.3	1.45
12/02/2016	10	11.4	1.49
05/02/2016	10	11.4	1.52

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
29/01/2016	10	11.4	1.55
22/01/2016	10	11.4	1.69
15/01/2016	10	11.4	1.75
08/01/2016	10	11.5	1.77
01/01/2016	11	10.9	1.78
25/12/2015	11	10.9	1.78
18/12/2015	11	10.9	1.69
11/12/2015	11	11.0	1.67
04/12/2015	11	11.0	1.80
27/11/2015	11	11.0	1.59
20/11/2015	11	11.0	1.60
13/11/2015	11	11.0	1.68
06/11/2015	11	11.0	1.80
30/10/2015	11	11.1	1.64
23/10/2015	11	11.1	1.63
16/10/2015	11	11.1	1.68
09/10/2015	11	11.1	1.73
02/10/2015	11	11.1	1.63
25/09/2015	11	11.2	1.74
18/09/2015	11	11.2	1.72
11/09/2015	11	11.2	1.70
04/09/2015	11	11.2	1.70
28/08/2015	11	11.2	1.75
21/08/2015	11	11.3	1.58
14/08/2015	11	11.3	1.65
07/08/2015	11	11.3	1.65
31/07/2015	11	11.3	1.64
24/07/2015	11	11.3	1.68
17/07/2015	11	11.4	1.78
10/07/2015	11	11.4	1.94
03/07/2015	11	11.4	1.86
26/06/2015	11	11.4	1.95
19/06/2015	11	11.4	1.80
12/06/2015	11	11.5	1.84
05/06/2015	11	11.5	1.81
29/05/2015	11	11.5	1.49
22/05/2015	11	11.5	1.58
15/05/2015	11	11.5	1.59

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
08/05/2015	11	11.5	1.51
01/05/2015	11	11.6	1.34
24/04/2015	11	11.6	1.15
17/04/2015	11	11.6	1.08
10/04/2015	11	11.6	1.17
03/04/2015	11	11.6	1.20
27/03/2015	11	11.7	1.21
20/03/2015	11	11.7	1.19
13/03/2015	11	11.7	1.24
06/03/2015	11	11.7	1.36
27/02/2015	11	11.7	1.31
20/02/2015	11	11.8	1.36
13/02/2015	11	11.8	1.33
06/02/2015	11	11.8	1.35
30/01/2015	11	11.8	1.30
23/01/2015	10	12.1	1.39
16/01/2015	10	12.2	1.46
09/01/2015	11	12.7	1.57
02/01/2015	10	12.2	1.56
26/12/2014	10	12.2	1.67
19/12/2014	11	12.7	1.71
12/12/2014	10	12.3	1.70
05/12/2014	10	12.3	1.84
28/11/2014	11	12.8	1.83
21/11/2014	9	12.3	1.83
14/11/2014	10	12.0	1.82
07/11/2014	10	12.9	1.94
31/10/2014	8	11.4	1.82
24/10/2014	9	11.2	1.94
17/10/2014	8	10.7	1.85
10/10/2014	8	10.8	1.87
03/10/2014	8	10.8	1.90
26/09/2014	8	10.8	1.92
19/09/2014	8	10.8	1.99
12/09/2014	8	10.8	2.01
05/09/2014	8	10.9	1.92
29/08/2014	8	10.9	1.89
22/08/2014	8	10.9	1.94

	Fluvius		
	Number of bonds considered # [A]	Average maturity Years [B]	Average yield % [C]
15/08/2014	8	10.9	1.94
08/08/2014	8	10.9	2.03
01/08/2014	8	10.9	2.11
25/07/2014	8	11.0	2.14
18/07/2014	8	11.0	2.16
11/07/2014	8	11.0	2.22
04/07/2014	8	11.0	2.29
27/06/2014	8	11.0	2.30
20/06/2014	8	11.1	2.38
13/06/2014	8	11.1	2.41
06/06/2014	8	11.1	2.40
30/05/2014	8	11.1	2.42
23/05/2014	8	11.1	2.47
16/05/2014	8	11.2	2.42
09/05/2014	8	11.2	2.55
02/05/2014	8	11.2	2.55
25/04/2014	7	10.7	2.60
18/04/2014	7	10.7	2.63
11/04/2014	7	10.7	2.62
04/04/2014	7	10.7	2.66
28/03/2014	7	10.7	2.66
21/03/2014	7	10.8	2.76
14/03/2014	7	10.8	2.68
07/03/2014	7	10.8	2.78
28/02/2014	7	10.8	2.77
21/02/2014	7	10.8	2.81
14/02/2014	7	10.9	2.82
07/02/2014	7	10.9	2.81
31/01/2014	7	10.9	2.81
24/01/2014	7	10.9	2.90
17/01/2014	7	10.9	2.98
10/01/2014	7	11.0	3.06
03/01/2014	7	11.0	3.13

Source: Brattle analysis on Bloomberg data.