The WACC for the Dutch Gas TSO

PREPARED FOR

ACM

PREPARED BY

Dan Harris

Lucrezio Figurelli

Massimiliano Cologgi

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THE Brattle GROUP

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I. Introduction and Summary

The Dutch Authority for Consumers and Markets (ACM) has commissioned The Brattle Group (Brattle) to calculate the Weighted Average Cost of Capital (WACC) for the Gas Transmission System Operator (Gas TSO) in the Netherlands for the next five-year regulatory period, January 2022-December 2026.[1]

The ACM has instructed us to calculate the WACC using ACM's methodology for the energy sector, as recently amended,[2] and to assess whether future developments in the Dutch energy sector may require any adjustment to the current methodology. In preparing this report we use data up to and including 15 June 2020, being the most recent data available at the time of our analysis.

In its 2016 method decision, the ACM used a 'real approach', which indexed the regulatory asset base with inflation, and required to calculate a real pre-tax WACC for both the year before the start of the regulatory period (2016) and the final year of the regulatory period (2021). The ACM has informed us that in the method decision for the next regulatory period it will use a 'nominal approach'. The ACM will no longer index the regulatory asset base, and will require a nominal pre-tax WACC for each year of the regulatory period 2022-2026.

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1 The ACM, through its predecessors NMa and OPTA, also commissioned The Brattle Group to estimate first the Equity Risk Premium and the Risk Free Rate, and later the overall WACC for the Dutch Electricity and Gas TSOs and Distribution System Operators (DSOs) in 2012 and 2013. See, respectively, Dan Harris, Bente Villadsen, and Francesco Lo Passo, "Calculating the Equity Risk Premium and the Risk-free Rate", 26 November 2012 ("Brattle 2012 Report"); and Dan Harris, Bente Villadsen, and Jack Stirzaker, "The WACC for the Dutch TSOs, DSOs, water companies and the Dutch Pilotage Organisation", 4 March 2013 ("Brattle 2013 Report").

2 ACM's WACC methodology for the energy sector for the current regulatory period (2017-2021) is described in Annex 2 of the 2016 method decision. However, in preparing this report the ACM has informed us of a number of changes to the methodology it will introduce in its method decision for the next regulatory period. We discuss these changes in the body of the report. See ACM, Uitwerking van de methode voor de WACC, Annex 2 to the method decisions 2017-2021 (available at: https://www.acm.nl/nl/publicaties/publicatie/16199/WACC-methode-bij-de-methodebesluiten-2017-2021).

The methodology also requires us to calculate a different WACC for existing capital and new investments (new capital).[3] Accordingly, the ACM has instructed us to calculate 10 WACCs:

The WACC for existing capital in 2022, 2023, 2024, 2025 and 2026.
The WACC for new capital in 2022, 2023, 2024, 2025 and 2026.

In line with ACM's methodology, we calculate the risk-free rate (RFR) as the average between the three-year average yields of ten-year government bonds in the Netherlands and in Germany. Over the three-year period 16 June 2017-15 June 2020, yields averaged 0.09% in Germany, and 0.23% in the Netherlands. Taking the average between the two gives us a RFR of 0.16%. We apply this value of the RFR to all WACCs.

We calculate the Equity Risk Premium (ERP) using long-term historical data on the excess return of shares over long-term bonds, using data from European markets. The methodology requires that the projected ERP should be based on the average of the arithmetic and geometric realized ERP for the Eurozone, using the market capitalization of each country's stock market as weights. The methodology also requires considering whether adjustments to the final ERP need to be made based on considerations of the historical average ERP, and ERP estimates based on dividend-growth models. Based on the available data, we select an ERP of 5%, which we apply to all WACCs. We find this value reasonable, and in line with the average value selected for the ERP by other European energy regulators.

The Dutch Gas TSO is not publicly traded. Therefore, we estimate the beta and gearing for the Gas TSO based on the median asset beta and gearing of a 'peer group' of regulated energy networks that have similar systematic risk to the Gas TSO in the Netherlands. To select our peer group of comparable companies, we start with the eight comparable companies used in the 2016 WACC analysis,[4] to which we add the Gas TSO in Romania. We check that the candidate peers still derive a majority of their revenues from regulated activities and test that their shares are sufficiently liquid to provide a reliable beta estimate. We end up with a group of seven peers: Elia, Enagas, Red Electrica, REN, Snam, TC Pipelines, and Terna. In line with ACM's methodology, we select the median asset beta (0.39) and gearing (80.6%) of the peer

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3 As we explain below, however, the two WACC's differ only with respect to the calculation of the cost of debt.

4 In 2016, the ACM commissioned the consultancy firm Rebel to estimate the WACC for the Dutch TSOs and DSOs. See Rebel, "The WACC for the Dutch TSOs and DSOs", 29 March 2016 (available at: https://www.acm.nl/nl/publicaties/publicatie/15617/Rapport-Rebel-The-WACC-for-the-Dutch-TSOs-and-DSOs).

group of companies to estimate the cost of equity (3.38%) of the Dutch Gas TSO. Using the median asset beta avoids giving excessive weight to more extreme beta values.

The ACM has also asked us to assess whether future developments in the Dutch energy sector may affect the cost of capital in a way that the current methodology does not reflect. Over the next decades it is expected that the use of natural gas in the Netherlands will decrease substantially, with a phasing out to be completed by 2050. At the same time, electricity use will increase substantially. We refer to these changes as the 'energy transition'.

There are two ways that the energy transition may potentially affect the cost of capital of the Gas TSO in the Netherlands. Both would affect the Gas TSO's beta. First, the expected decline in volumes for the gas network may affect the systematic risk faced by the Gas TSO, and hence beta. Second, significant differences in future investment requirements between electricity and gas TSOs 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 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 Dutch Gas TSO. For the second affect, our analysis shows that there is no expected change in investment behaviour that could affect the beta of the peers and of the Dutch Gas TSO. We conclude that, at least for the next regulatory period, current betas remain a good estimate of future betas. There is no need to adjust the cost of capital methodology as a result of the energy transition.

ACM's methodology makes a distinction between existing capital and new capital in calculating the cost of debt.

- With respect to the existing capital, the methodology requires to calculate the cost of debt based on the 'staircase model', which assumes that the regulated companies finance their existing investment with ten-year loans, and refinance 10% of their debt every year. The methodology further distinguishes between historical years and future years, which vary depending on the year for which we are estimating the WACC. For historical years, the methodology takes the average daily yield to maturity of comparable debt in any given calendar year. For future years, the methodology takes the average daily yield to maturity of comparable debt over the three years prior to the measurement date. We find this method reasonable, because it recognises that TSOs finance existing infrastructure with a mix of legacy debt and more recently issued debt, and that the cost of the debt varies over time.

- With respect to new capital, the methodology requires to calculate the cost of debt simply based on the average daily yield to maturity of comparable debt over the three years prior to the measurement date. Again, this recognises that new capital will be financed with newly issued debt, and that recent debt yields are likely to be a good estimate of future debt costs.

As a measure of comparable debt, we consider the yield on a utility index of 10-year bonds with a rating of A, which is consistent with the credit rating of network operators in the Netherlands. We add 15 basis points to cover the costs of issuing debt. This methodology results in a pre-tax cost of debt in the range 1.16%-1.49% depending on the WACC considered.

We understand that the current corporate tax rate will be lowered to 21.7% in 2021. Accordingly, we use 21.7% as the applicable tax rate for the next regulatory period, January 2022-December 2026.

The ACM has also asked us to calculate a real WACC. Accordingly, we convert the estimated nominal WACC to a real WACC using an estimate of inflation for the Netherlands. ACM's methodology for the energy sector requires to calculate a inflation using both historic and forecast inflation. Based on this methodology, we arrive at an estimate of inflation of 1.69%.[5]

Table 1 reports our estimates of the WACCs for the Gas TSO.

[5] Note that our estimate of inflation is the same for each year of the regulatory period 2022-2026. This is because CPI inflation in the Netherlands forecast by the Dutch Economic Planning Bureau for the period 2022-2025 is constant.

Table 1: Summary of WACC Calculation

			Existing capital					New capital
			2022	2023	2024	2025	2026	2022-2026
			[A]	[B]	[C]	[D]	[E]	[F]
Gearing (D/A)	[1]	[2]/(1+[2])	45%	45%	45%	45%	45%	45%
Gearing (D/E)	[2]	Table 9	80.6%	80.6%	80.6%	80.6%	80.6%	80.6%
Tax rate	[3]	ACM	21.7%	21.7%	21.7%	21.7%	21.7%	21.7%
Risk free rate	[4]	See note	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%
Asset beta	[5]	Table 9	0.39	0.39	0.39	0.39	0.39	0.39
Equity beta	[6]	[5]x(1+(1-[3])x[2])	0.64	0.64	0.64	0.64	0.64	0.64
Equity Risk Premium	[7]	Assumed	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
After-tax cost of equity	[8]	[4]+[6]x[7]	3.38%	3.38%	3.38%	3.38%	3.38%	3.38%
Pre-tax cost of debt	[9]	Table 11	1.49%	1.32%	1.22%	1.18%	1.18%	1.16%
Nominal after-tax WACC	[10]	((1-[1])x[8])+([1]x(1-[3])x[9])	2.39%	2.33%	2.30%	2.28%	2.29%	2.28%
Nominal pre-tax WACC	[11]	[10]/(1-[3])	3.06%	2.98%	2.93%	2.92%	2.92%	2.91%
Inflation	[12]	Table 12	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
Real pre-tax WACC	[13]	(1+[11])/(1+[12]) -1	1.34%	1.27%	1.22%	1.21%	1.21%	1.20%

Notes:
[4]: Average German and Dutch 10Y Government Bond yield over the period 06/16/2017 - 06/15/2020.

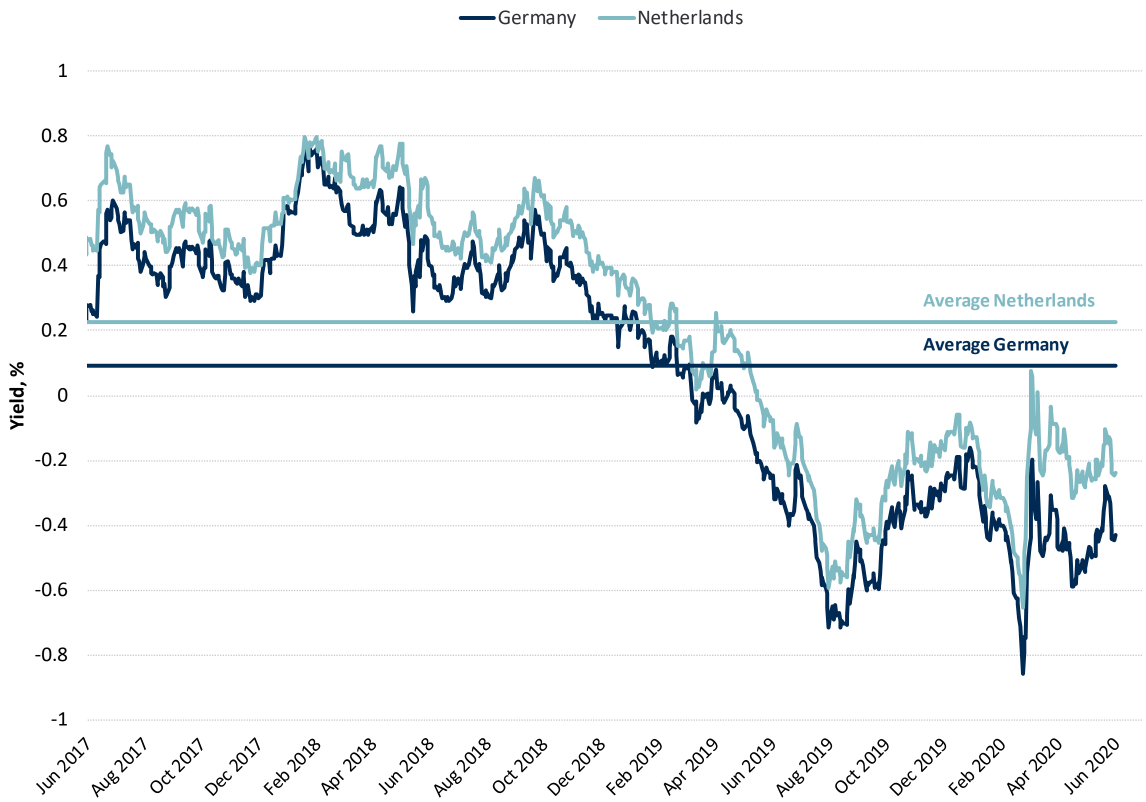
II. The Risk-Free Rate

ACM's methodology calculates the risk-free rate as the average yield on 10-year government bonds over the last three years in the Netherlands and in Germany. Figure 1 illustrates the yields on 10-year government bonds over the past three years in the Netherlands and in Germany. Over our three-year reference period, the nominal government bond yields have remained at historical lows, fluctuating above zero until the end of 2018, when they started falling steadily, entering into negative territory around June of 2019, and remaining negative though the end of our reference period, being June 2020.[6] The steep fall in bond yields in mid-2019 was a result of the European Central Bank (ECB) re-starting its Quantitative Easing (QE) stimulus program. In response to the Covid-19 pandemic crisis, in March 2020 the ECB

[6] The significant recent drop in government bond yields is largely attributable to the ECB's decision to relaunch its quantitative easing (QE) program. In December 2018, the ECB had announced that it would end its € 30 billion a month bond-buying scheme, though it would continue to reinvest the proceeds of maturing bonds purchased through the program (see "ECB ends €2.5tn Eurozone QE stimulus programme," BBC, December 13 2018). However, only a few months later, the ECB announced that it would introduce a new package of measures, including a renewed QE program from October 2019 (see "European Central Bank paves way for fresh stimulus package", Financial Times, July 25 2019).

launched a €750 billion asset purchase programme through the Pandemic Emergency Purchase Programme (PEPP).[7] However, Figure 1 below illustrates that the PEPP seems to have had only a temporary effect on bond yields. Yields briefly dipped below minus 0.8%, but then increased again to pre-PEPP levels. This may be due to an increase in government default risk perceived by investors due to the pandemic. Overall, the effect of the PEPP program on the RFR is very limited, because we consider a three year average. Over the three-year period ending on 15 June 2020, yields were 0.23% on average in the Netherlands, and 0.09% on average in Germany. Taking the average between the two gives us a risk-free rate of 0.16%.[8]

Figure 1: Dutch and German 10-Year Government Bond Yields (June 2017–June 2020)



Source: Bloomberg.

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[7] See European Central Bank Press Release, "ECB announces €750 billion Pandemic Emergency Purchase Programme (PEPP)", 18 March 2020 (available at: https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200318_1~3949d6f266.en.html).

[8] As sensitivity, we calculate that applying a lower bound of zero to the yield of government bonds increases the risk-free rate by 0.12%.

III. The Equity Risk Premium

ACM's methodology specifies that the ERP should be based on a historical time-series of the excess return of stocks over long-term bonds for the Eurozone economies. Specifically, ACM has determined to use the simple average of the long-term arithmetic and geometric ERP for the Eurozone as the anchor for the ERP estimate. The ERP for individual countries in the Eurozone should be weighted using the current capitalization of each country's stock market.[9] 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 a Dutch investor 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.

Table 2, below, illustrates the realised ERP derived from one of the most widely used sources for long-run excess returns, being the data published by Dimson, Marsh and Staunton (DMS) for individual European countries taken from the February 2020 DMS report.[10] This report contains ERP estimates using data up to and including 2019. Table 2 shows the simple and weighted averages of the ERP for the Eurozone countries for which DMS have data. We find that the simple average between the arithmetic and geometric ERP for the period 1900 to 2019 inclusive was 5.49% for the Eurozone. Using each country's stock market capitalization to weight the averages across the Eurozone, we derive an ERP of 4.95% for 2019.

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

10 Credit Suisse Global Investment Returns Sourcebook 2020, Table 9.

Table 2: Historic Equity Risk Premium Relative to Bonds (1900 – 2019)

		Included in Eurozone averages	Geometric mean	Arithmetic mean	Average	Country Market Cap (2019)
			Risk premiums relative to bonds, 1900 - 2019			
			%	%	%	USD mln
			[A]	[B]	Average [A], [B]	[C]
Austria	[1]	1	2.70	21.00	11.85	138,000
Belgium	[2]	1	2.10	4.10	3.10	406,467
Denmark	[3]		3.40	5.10	4.25	479,237
Finland	[4]	1	5.10	8.60	6.85	266,031
France	[5]	1	3.10	5.30	4.20	2,715,221
Germany	[6]	1	4.90	8.20	6.55	2,265,358
Ireland	[7]	1	2.60	4.60	3.60	117,905
Italy	[8]	1	3.10	6.40	4.75	677,642
Norway	[9]		2.60	5.40	4.00	317,666
Netherlands	[10]	1	3.30	5.50	4.40	735,273
Portugal	[11]	1	5.00	9.10	7.05	72,138
Spain	[12]	1	1.60	3.50	2.55	724,695
Sweden	[13]		3.20	5.40	4.30	855,100
Switzerland	[14]		2.20	3.70	2.95	1,877,703
United Kingdom	[15]		3.60	4.90	4.25	3,492,623
Average Eurozone	[16]		3.35	7.63	5.49	
Value-weighted average Eurozone	[17]		3.50	6.40	4.95	

Notes and sources:
[A][1]-[15], [B][1]-[15]: Credit Suisse Global Investment Returns Sourcebook 2020, Table 9.
[16]: Average [1], [2], [4], [5], [6], [7], [8], [10], [11], [12].
[17]: Average [1], [2], [4], [5], [6], [7], [8], [10], [11], [12], weighted by [C].

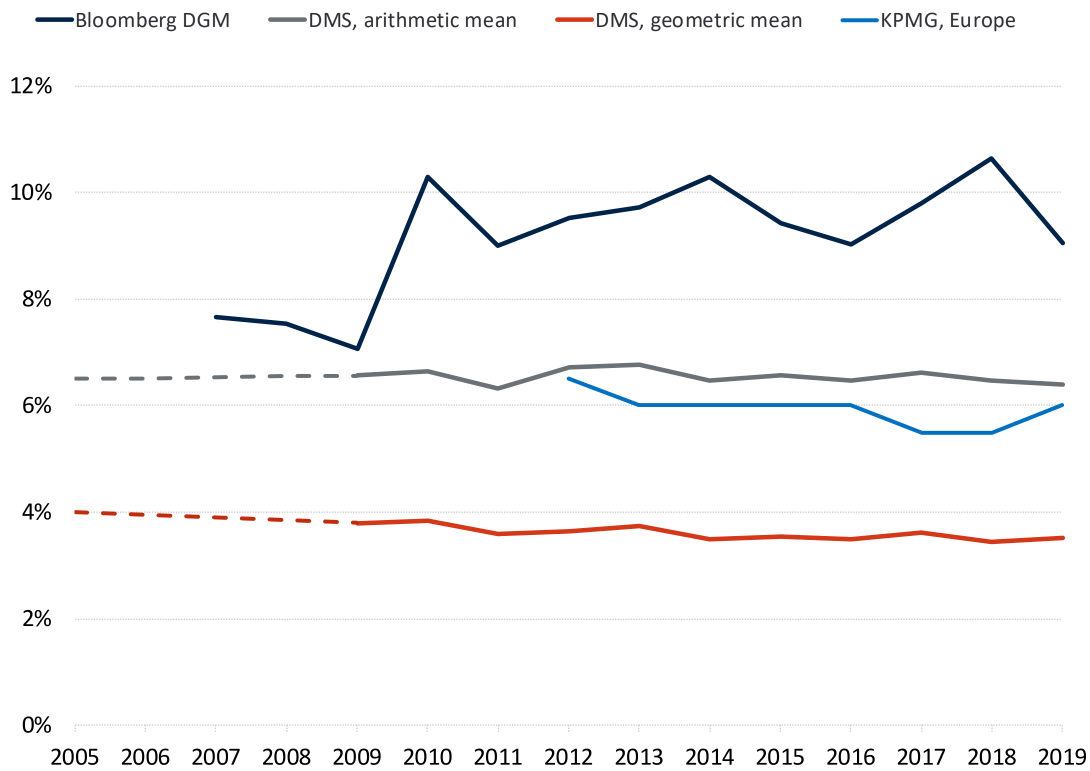
ACM's methodology requires us to look at evidence on the ERP from the dividend growth model (DGM) as a 'sanity check' on the ERP estimate based on historical data. For example, after the 2009 financial crisis, historical data indicated a decrease in the ERP, because realised returns of stocks over bonds were very low. But the DGM indicated that the ERP had if anything increased after the crisis. The DGM result made sense, since investors would likely have perceived more risk and demanded higher returns immediately after the crisis. Hence, the results of the DGM indicated that, for this period, a downward reduction in the ERP was not justified, even though this is what the unadjusted historical data indicated.

In Figure 2, below, we compare the DMS estimates of the arithmetic and geometric means of the historical ERP for the Eurozone to the forward looking estimates of the ERP based on Bloomberg's and KPMG's DGMs.[11] KPMG's estimate of the ERP remained relatively stable over the past few years, unchanged between 2017 and 2018 at 5.5%, and increasing to 6% in 2019. Bloomberg DGM estimate of the ERP increased from 9.8% in 2017 to 10.6% in 2018 and decreased to 9.06% in 2019. On the other hand, the average of the arithmetic and geometric

[11] KPMG provides a DGM-based estimate of the ERP for Europe based on the implied equity returns of European indices. See "Equity Market Risk Premium - Research Summary", KPMG, 31 December 2018. Bloomberg provides daily DGM-based estimates of the ERP for individual European countries under the 'Country Risk Premium' function. We use Bloomberg's DGM-based ERP estimates for individual Eurozone countries as of 31 December of each year to calculate a weighted average DGM-based ERP for the Eurozone.

means based on the historical DMS data decreased from 5.11% in 2017 to 4.95% in 2018, and remained unchanged between 2018 and 2019. However, the drop in the DMS historical ERP between 2017 and 2018 was primarily driven by a sharp drop in stock prices at the end of 2018.[12] Hence, the apparent fall in the ERP seen in the 2018/2019 DMS data could be an anomaly. The DGM evidence indicates that the ERP may not actually have decreased, as the historical data of 2018/2019 is indicating. Furthermore, Figure 2 does not capture the most recent market developments during the Covid pandemic. The significant drop and increased volatility in stock prices during the pandemic may have actually increased the ERP expected by investors.

Figure 2: Eurozone Equity Risk Premiums, by Year



Notes: DMS estimates for 2007 and 2008 calculated assuming a linear trend between 2005 and 2009 estimates.

To investigate this possibility, in Table 3, below, we report the average of the geometric and arithmetic average DMS ERP for the Eurozone weighted by stock market capitalisation for each of the years 2015-2019 inclusive. The average ERP over this five-year period was 5.01%.[13] This

12 Overall, the stock market capitalization for the Eurozone economies fell by 20% on average.

13 Note that the in calculating the Eurozone averages, at the request of ACM, we include Austria, for which DMS reports a value of the arithmetic mean of 21.1%. Excluding Austria would reduce the value weighted Eurozone average of the arithmetic mean from 6.46% to 6.19%, and the average between the value-weighted arithmetic and geometric means from 4.95% to 4.82%.

is higher than the ERP of 4.95% indicated by the 2018 and 2019 DMS reports. Based on this evidence, an ERP of 5.0% seems reasonable.

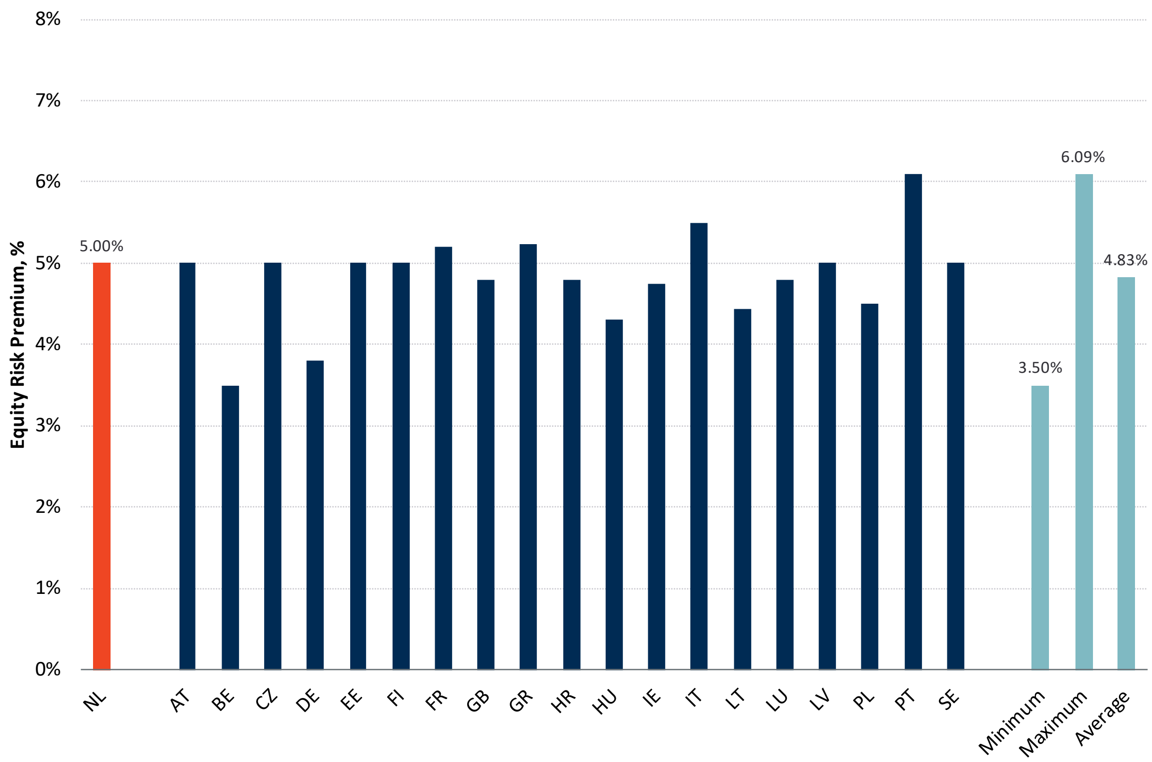
Table 3: DMS ERP Data 2015 - 2019

	Geometric mean [A] %	Arithmetic mean [B] %	Average [C] %
2015	3.54	6.57	5.05
2016	3.49	6.47	4.98
2017	3.61	6.61	5.11
2018	3.45	6.46	4.95
2019	3.50	6.40	4.95
Average	3.52	6.50	5.01

Notes:
Brattle calculations using data from Credit Suisse Global Investment Returns Sourcebook, 2016-2020.
[A], [B]: Value weighted average for the Eurozone.
[C]: Average [A], [B].

We also benchmark this value against the value selected for the ERP by other European energy regulators (Figure 3 illustrates). About a third of the sampled regulators selected a value of the ERP equal to 5%. Overall, the average value is 4.83%, close to the 5.0% we propose. This further confirms that an ERP of 5.0% is reasonable.

Figure 3: ERP Values Selected by Other European Energy Regulators



Source: Brattle analysis on data from CEER, Report on Regulatory Frameworks for European Energy Networks, January 2020.
For France, data from CRE, Deliberation n. 2019-270, December 2019, p. 44.

In previous reports for the ACM,[14] we have explained that there is of course no guarantee that the long-run historical risk premium exactly matches the expected future ERP that investors demand now. DMS, for example, argue that a number of unexpected and positive factors might have led the realized ERP to be higher than the ERP that investors would have demanded or expected. Accordingly, they suggest to apply a downward adjustment to the historical ERP to account for events which happened in the past but, in the view of DMS, are unlikely to occur in the future.[15] The ACM noted that estimates of the ERP from DGM were higher than the historical data. On the other hand, the ACM did not apply the downward adjustment to the

[14] See, *e.g.*, Brattle 2012 Report.

[15] For example, DMS argue technology advances have made investment diversification cheaper and easier, thus reducing risk and the expected ERP. In this light, the historical ERP would be an upward-biased forecast of the future ERP. Similarly, an upward trend in stock prices relative to dividends may suggest a declining trend in the ERP. Price-dividend ratios have indeed increased over the last 60 years, and DMS argue that this upward trend is unlikely to continue. However, while adjusting the historical averages for trends in price-dividend ratios may seem plausible, DMS ignore other reasons why price-dividend ratios have increased, including share repurchases and payments to selling shareholders in takeovers, both leading to higher price-dividend ratios. Therefore the trend of increasing price-dividend ratios does not necessarily imply that the expected ERP is lower than historical averages.

historical data that DMS suggested. Hence, the use of unadjusted historical data seems reasonable.

IV. Selection of Peers

IV.A. Potential Peers

The Dutch Gas TSO is not publicly traded. Therefore, to estimate the beta and gearing for the Gas TSO we need to find publicly traded firms with similar systematic risk. We can then estimate the beta and gearing value from these firms, which we call ‘comparators’ or ‘peers’.

In determining the number of peers, there is a trade-off. On the one hand, adding more peers to the group reduces the statistical error in the estimate of the beta. On the other hand, as more peers are added, there is a risk that they may have a different systematic risk than the regulated TSO’s, which makes the beta estimate less accurate. In statistical terms, once we have 6-7 peers in the group the reduction in the error from adding another firm is relatively small.

To select our peer group of comparable companies, we start with the eight comparable companies used in the 2016 analysis.[16] To this initial list of candidate peers, we add the UK network company National Grid and the Romanian TSO Transgaz. Table 4 provides our list of the candidate peers. All peers have a credit rating at or above investment grade level.

16 In 2016, Rebel selected Snam, Terna, Red Electrica, Enagas, Elia, REN, Fluxys and TC Pipelines. With the exception of TC Pipelines – a US company – all other peers were European.

Table 4: Firms Selected as Potential Peers

		Country	Credit rating
		[A]	[B]
Elia Group SA/NV	[1]	Belgium	BBB+
Enagas SA	[2]	Spain	BBB+
Fluxys Belgium SA	[3]	Belgium	n/a
National Grid PLC	[4]	United Kingdom	A-
Red Electrica Corp SA	[5]	Spain	A-
REN - Redes Energeticas Nacionais SGPS SA	[6]	Portugal	BBB
Snam SpA	[7]	Italy	BBB+
Terna Rete Elettrica Nazionale SpA	[8]	Italy	BBB+
Transgaz SA Medias	[9]	Romania	BBB-
TC Pipelines LP	[10]	United States	BBB

Notes:
[B]: Bloomberg. Ratings are from S&P and Fitch for Transgaz.

IV.B. Liquidity, Credit Rating and M&A activity

Illiquid stocks tend to underestimate the true industry beta.[17] Hence, for each of the potential peers in the initial sample, we test to see if the firms' shares are sufficiently liquid.

Historically, the ACM methodology applied two criteria. First, the shares of the candidate peers had to be traded on at least 90% of the days in which the relevant market index traded over the reference period (the number of trading days test). Second, the ACM methodology required that the candidate peers had annual revenues of at least € 100 million (the annual revenue requirement), on the basis that firms with larger revenues are likely to have shares that are liquidly traded.

[17] 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. Using weekly returns to calculate beta mitigates this problem, since it is more likely that the firm's shares will be traded in the week. However, using weekly returns have other disadvantages, such as providing 80% less data points over any given period.

In previous reports for the ACM we performed additional checks that the two criteria would not produce any 'false positives'.[18] For example, we generally exclude companies involved in substantial M&A activity during the estimation window. M&A activity tends to affect a firm's share price in a way that is unrelated to the systematic risk of the business. Hence, similar to illiquid stock, the observed beta for a firm with substantial M&A activity will tend to underestimate the true beta for the business. Accordingly, excluding firms involved in 'substantial' M&A activity helps ensure a reliable beta estimate. We also only included companies with an investment grade credit rating. This is because share-prices of firms with lower credit ratings tend to be more reactive to company-specific news. For these companies, the measured beta will tend to underestimate the true beta.

More recently, in response to a court ruling,[19] the ACM commissioned a study to provide a recommendation on the appropriate criteria to select peers for efficient beta estimation. The study determined that the two existing criteria adopted by ACM should be modified, and that a bid-ask spread threshold of 1% should be applied instead as the primary liquidity criterion.[20] The ACM has asked us to follow this recommendation, and to perform additional liquidity tests as 'sanity checks' on the results. We find this to be a reasonable approach to test for liquidity.

We calculate the average bid-ask spread as a percentage of the stock price over the reference period 16 June 2017-15 June 2020.[21] As illustrated in Figure 4, the bid-ask spread is generally below 0.25% for most companies. Only Fluxys has a bid-ask spread above the 1% threshold, so we exclude this company from the final sample.[22]

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[18] See, e.g., Dan Harris, Lucrezio Figurelli, Flora Triolo, Massimiliano Cologgi, "The WACC for Drinking Water Companies in the Netherlands", 9 July 2019, Sections IV.B, IV.D and IV.E.

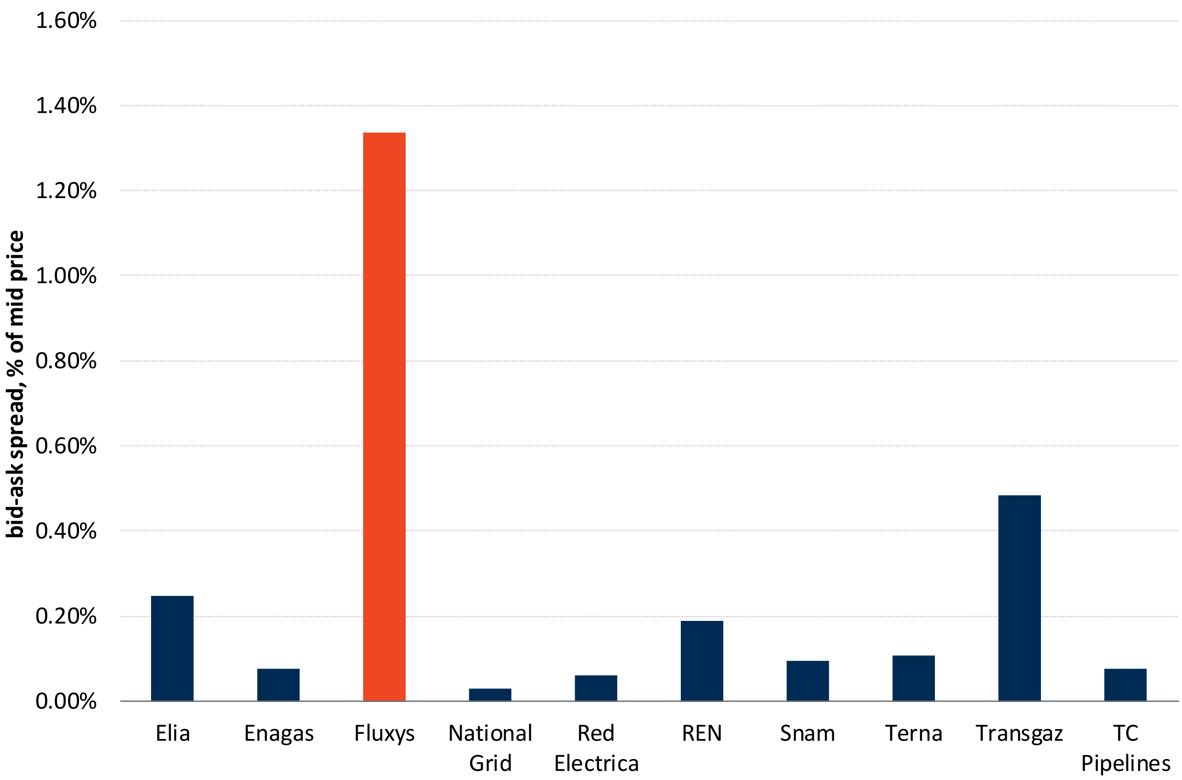
[19] The court ruling was directly related to the peer group of companies used to estimate the beta for the Dutch network companies. The court found that one of the peer companies, Fluxys, did satisfy both the number of trading days and annual revenue requirements. However, the court determined that a high value of the bid-ask spread demonstrated that Fluxys' shares were illiquid.

[20] Frontier Economics, "Criteria to select peers for efficient beta estimation. A report for the ACM", 8 January 2020.

[21] More specifically, we calculate the daily value of the bid-ask spread as the difference between bid price and ask price at closing divided by the average between the bid price and the ask price. We then calculate the simple average of the daily bid ask spreads over the relevant period.

[22] We have also verified that the shares of the candidate peers were sufficiently liquid by reference to the number of days traded and to the volume of daily trades. These additional sanity checks confirmed that the shares of the other candidate peers (that is, excluding Fluxys) were sufficiently liquid.

Figure 4 Bid-Ask spread of the Potential Peers



Source: Brattle calculations on Bloomberg data for the period June 2017-June 2020, and June 2019-June 2020 for Transgaz because of data availability.

As illustrated in Figure 4, the only other company with a bid-ask spread higher than 0.25% is the Romanian TSO Transgaz. Though its bid-ask spread (0.48%) is below the 1% threshold, we have excluded Transgaz from the final sample because it was only recently, in July 2019, that it obtained an investment grade credit rating.[23]

We further check that the potential peers have not been involved in sizeable M&A activity during the reference period. As explained above, M&A activity can depress the beta below its true level. Among the candidate peers considered, no one was involved in sizeable M&A activity during the reference period.[24]

23 In July 2019, Fitch assigned Transgaz a BBB- rating, which is the bottom end of investment grade. For a history of Transgaz ratings, see http://new.transgaz.ro/en/investors/history-transgaz-rating.

24 We define sizeable M&A activities as M&A transactions with a value exceeding 30% of the average market capitalization of the firm during the 30 days before the transaction takes place.

IV.C. Regulated Revenues

Ideally, the firms we select as peers should earn most of their revenues from regulated activities similar to the Dutch Gas TSO. Accordingly, we have checked the portion of revenues that the companies in the peer group earn from regulated energy transmission and distribution. As reported in Table 5, below, with the exception of Fluxys and National Grid, all candidate peers derive the vast majority of their revenues from regulated energy transmission and distribution activities.[25]

Table 5: Revenue from Regulated Energy Transmission and Distribution

		Country	Regulated transmission revenues
		[A]	[B]
Elia Group SA/NV	[1]	Belgium	99%
Enagas SA	[2]	Spain	81%
Fluxys Belgium SA	[3]	Belgium	60%
National Grid PLC	[4]	United Kingdom	n/a
Red Electrica Corp SA	[5]	Spain	90%
REN - Redes Energeticas Nacionais SGPS SA	[6]	Portugal	93%
Snam SpA	[7]	Italy	99%
Terna Rete Elettrica Nazionale SpA	[8]	Italy	91%
Transgaz SA Medias	[9]	Romania	96%
TC Pipelines LP	[10]	United States	100%

We already exclude Fluxys because of a high bid-ask spread. With respect to National Grid, we note that in 2016 ACM's consultant excluded it because it did not have a high enough share of revenues from regulated transmission and distribution activities.[26] In Table 6, we provide the breakdown of National Grid's revenues as reported in their annual accounts. On average, in 2019 and 2020 National Grid earned 30% of its revenues from regulated energy transmission activities in the UK, and 65% from regulated activities in the US. However, for US regulated

[25] Note that we do not apply a strict criterion for the minimum percentage of revenues that a peer must derive from regulated activities. In practise, decisions regarding which peers to include always involve a trade-off between the comparability of the individual peers and the final number of peers. In some cases, we may accept a lower percentage of revenues from regulated revenues to expand the peer group, and vice versa.

[26] Rebel (2016), p. 5. See also, Rebel, "Memo: Onderwerp Reactie op zienswijzen WACC", 26 July 2016 (available at: https://www.acm.nl/sites/default/files/old_publication/publicaties/16168_rebel-reactie-op-zienswijzen-wacc-2016-07-26.pdf).

activities we cannot distinguish between revenues related to energy transmission and distribution and revenues related to the sale of energy. Accordingly, we have chosen to exclude National Grid from the final sample.

Table 6: National Grid Revenues

		31-Mar-20 [A] £ mln	31-Mar-19 [B] £ mln	31-Mar-20 [C] %	31-Mar-19 [D] %	Average [E] Average [C],[D]
Revenues						
UK Electricity Transmission	[1]	3,702	3,351	25%	22%	24%
UK Gas Transmission	[2]	927	896	6%	6%	6%
US Regulated Operations	[3]	9,205	9,846	63%	66%	65%
NGV and Other	[4]	706	840	5%	6%	5%
Total	[5]	14,540	14,933	100%	100%	100%
Operating Profit						
UK Electricity Transmission	[6]	1,320	1,015	40%	29%	35%
UK Gas Transmission	[7]	348	303	11%	9%	10%
US Regulated Operations	[8]	1,397	1,724	42%	50%	46%
NGV and Other	[9]	242	400	7%	12%	9%
Total	[10]	3,307	3,442	100%	100%	100%

Notes:
[1]-[5]: National Grid Full Year Results Statement, 2018-2019, pp. 23, 26, 28, 35, 2019-2020, p.121. [4] derived.
[6]-[10]: National Grid Full Year Results Statement, 2018-2019, p. 17, 2019-2020, p.30.

IV.D.The Final Sample of Peers

In Table 7, below, we provide a summary of the results of the screening tests we applied to arrive at our final sample of peers.

Table 7: Screening Tests Summary

		Country [A]	Bid-ask spread [B]	M&A [C]	Regulated transmission revenues [D]	Investment grade [E]	Final sample [F]
Elia Group SA/NV	[1]	Belgium	✓	✓	✓	✓	✓
Enagas SA	[2]	Spain	✓	✓	✓	✓	✓
Fluxys Belgium SA	[3]	Belgium	×				×
National Grid PLC	[4]	United Kingdom	✓	✓	×		×
Red Electrica Corp SA	[5]	Spain	✓	✓	✓	✓	✓
REN - Redes Energeticas Nacionais SGPS SA	[6]	Portugal	✓	✓	✓	✓	✓
Snam SpA	[7]	Italy	✓	✓	✓	✓	✓
Terna Rete Elettrica Nazionale SpA	[8]	Italy	✓	✓	✓	✓	✓
Transgaz SA Medias	[9]	Romania	✓	✓	✓	×	×
TC Pipelines LP	[10]	United States	✓	✓	✓	✓	✓

V. Beta and Gearing

As explained above, the Dutch Gas TSO is not publicly traded. Accordingly, we estimate the systematic risk for the Dutch TSO using our peer group of firms which are publicly traded and derive the majority of their revenues from regulated transmission and distribution activities.

V.A. Peer Group Equity Betas

ACM's methodology specifies a three-year daily sampling period for the beta. We agree that this sampling period and frequency should give sufficient observations for a robust beta estimate. Accordingly, we estimate equity betas for the peer group of firms by regressing the daily returns of individual stocks on market returns over the last three years.[27]

The systematic risk of each peer, as summarised in its beta parameter, must be measured against an index representing the overall market. A hypothetical investor in the Dutch TSO would likely diversify its portfolio within a single currency zone so as to avoid exchange rate risk. Using indices from the relevant country or currency zone avoids exchange rate movements depressing the betas, and should result in a higher beta estimate than if we estimated betas against an index derived in a different currency.[28] Accordingly, to calculate market returns we use a broad Eurozone index for companies operating in the Eurozone (the Stoxx Europe 600 (SXXP)), and a national US index for TC Pipelines (the S&P 500).[29]

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[27] As mentioned above, we use the three-year period 16 June 2017 through 15 June 2020 as our estimation window for the beta of all firms on the peer group.

[28] For example, suppose we calculate the beta of a US firm, whose shares are priced in USD and which earns most of its profits in USD, against an index denominated in Euros. Large changes in USD-EUR exchange rates would reduce the beta. This is because, in Euro terms, the depreciation of the Euro would cause the returns of the US firm to increase, while the Euro-denominated index has not changed. This reduces the covariance between the returns on the index and the return on the US firm, which results in a lower estimate of beta. From the perspective of a Eurozone investor, the lower beta represents the diversification benefits of investing in another currency. However, it would not be correct to then apply this beta for a Eurozone investor investing in a firm in the Eurozone, which does not have the same diversification benefit, or for a US investor investing in a US firm.

[29] The Stoxx Europe 600 (SXXP) and the S&P 500 indices are the most commonly followed stock market indices for the Eurozone and the U.S. They are both broad equity indices considered to be representative of the Eurozone and U.S: stock markets. The Stoxx Europe 600 qualifies as a 'broad Eurozone index for companies operating in the Eurozone' even though it includes countries outside

We perform a series of diagnostic tests to assess if the beta estimates satisfy the standard conditions underlying Ordinary Least Squares (OLS) regression. We test for autocorrelation using the Breusch-Godfrey test, but rely on the OLS estimate of the beta parameter even in the presence of autocorrelation.[30] We test for the presence of heteroscedasticity using the White's test and use White's-Huber robust standard errors.

In addition to the above diagnostic tools and adjustment procedures, the ACM has asked us to apply a new test for market imperfections. This test requires us to use a weekly beta instead of the daily beta if it appears that share prices react to news the day before or the day after the market index reacts. This could occur because of differences in market opening times and trading hours, or differences in the liquidity of the firm's shares relative to the average liquidity of the market. If such an effect is present, a beta estimated using daily returns on the firm's share and on the market index may be biased. Similarly, financial market frictions caused by information asymmetries, transaction costs, limit orders, and overreaction to news may also affect the way information is incorporated in the share price. In contrast weekly betas are less sensitive to the speed at which share prices assimilate information, because they use returns over five trading days.

In practice, the new test is a modified version of the Dimson adjustment applied by the ACM in its previous method decision. The Dimson adjustment regresses a company's daily returns using the market index returns one day before and one day after as additional regressors.[31] If the market is perfectly efficient, all information should be dealt with on the same day. The new test considers that if the lag or the lead coefficient are either significantly different from zero or jointly significantly different from zero, this suggests that information about the true beta may be lost by considering only the simple regression. This problem can be largely resolved using weekly data to estimate the equity beta.

We have performed this test for the firms in our peers group. The test for market imperfections yields positive results for three firms out of the total sample, suggesting that information on

of the Eurozone, namely the UK, Denmark, Norway and Sweden. This is because the economy in these countries is connected tightly to the economy of Eurozone countries. Furthermore, companies traded in the UK, Denmark, Norway and Sweden included in the index earn large portions of their revenues and profits in Euros, so that stock returns for these companies are more correlated to returns in the Eurozone than to their local stock market.

30 We test for autocorrelation up to three lags. Note that the OLS estimator of the beta is unbiased (not systematically too high or too low) and consistent (converges to the correct value) even in the presence of autocorrelation.

31 More days of leads and lags can be applied, but in this case we look at only one.

systematic risk is contained within the adjacent days. Hence for these three firms we take the weekly beta. For the remaining firms we take the daily OLS beta. Table 8 shows our results.

Table 8: Equity Betas

		Results		
		Beta	Robust standard error	Beta selected
		[A]	[B]	[C]
Elia Group SA/NV	[1]	0.68	0.11	Daily
Enagas SA	[2]	0.72	0.12	Daily
Red Electrica Corp SA	[3]	0.54	0.12	Daily
REN - Redes Energeticas Nacionais SGPS SA	[4]	0.66	0.10	Weekly
Snam SpA	[5]	0.93	0.15	Daily
Terna Rete Elettrica Nazionale SpA	[6]	0.74	0.10	Weekly
TC Pipelines LP	[7]	0.61	0.19	Weekly

V.B. Asset Betas and Gearing

As well as reflecting the systematic risk of the underlying business, equity betas also reflect the risk of debt or 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 necessary to 'unlever' the betas, imagining that the firm is funded entirely by equity. The resulting beta is referred to as an asset beta or an unlevered beta. To accomplish the un-levering, the methodology specifies the use of the Modigliani and Miller formula.[32]

Consistent with the three-year reference period used to estimate the beta, we calculate the gearing of each comparator as the three-year average of quarterly gearing ratios obtained dividing quarterly net debt over quarterly market capitalization.

32 The specific construction of this equation was suggested by Hamada (1972) and has three underlying assumptions: a constant value of debt; a debt beta of zero; that the tax shield has the same risk as the debt.

Table 9 reports our estimates of the gearing and asset betas for the peer group of companies. Overall, the asset betas range between 0.29 (REN) and 0.58 (Snam), with a median asset beta of 0.39. In line with the ACM methodology we select an asset beta of 0.39.

Table 9: Equity and Asset Betas

		Equity beta [A]	Gearing (D/E) [B]	Tax rate [C]	Asset beta [D]
Elia Group SA/NV	[1]	0.68	103.2%	29.8%	0.39
Enagas SA	[2]	0.72	82.8%	25.0%	0.45
Red Electrica Corp SA	[3]	0.54	56.7%	25.0%	0.38
REN - Redes Energeticas Nacionais SGPS SA	[4]	0.66	163.4%	21.0%	0.29
Snam SpA	[5]	0.93	80.6%	24.0%	0.58
Terna Rete Elettrica Nazionale SpA	[6]	0.74	76.0%	24.0%	0.47
TC Pipelines LP	[7]	0.61	79.0%	29.2%	0.39
Median	[8]		80.6%		0.39

Notes and sources:
[A]: Brattle calculations on Bloomberg data.
[B]: Brattle calculations on Bloomberg data. Average values from Q2 2017 to Q1 2020.
[C]: KPMG Corporate Tax Rates. Average values from H2 2017 to H1 2020.
[D]: [A]/(1+(1-[C])x[B]).

ACM's methodology requires to select a gearing by reference to the peer group of companies. However, the gearing should also be consistent with a single A credit rating for an energy network in the Netherlands. In Table 10, below, we show that the rating of the peers has remained stable and generally below the single A rating. Gearing, however, is only one of the metrics considered by rating agencies for making their rating determinations. Dutch energy networks benefit from the stability of the Dutch regulatory framework and from the higher rating of the Dutch government debt (AAA) relative to Belgium (AA), Italy (BBB), Portugal (BBB) and Spain (A).[33] Therefore, a Dutch energy network with the gearing of the comparator group would likely be able to maintain a single A rating.

As reported in Table 9, the gearing of the peer group of companies ranges between 57% (Red Electrica) and 163% (REN), with a median gearing level of 80.6%. Based on the considerations

[33] In rating the Dutch energy networks Gasunie and TenneT, for example, the rating agency Moody's applies two-notch uplift to the networks' baseline ratings to account for the Dutch government's ownership interest and the strategic importance of the business to national energy policy in the Netherlands. Furthermore, the regulatory environment and the local government rating directly affect the baseline credit ratings. See, *e.g.*, Moody's Investor Service, "TenneT Holding B.V.: Update following 2019 results", May 2020, pp. 1 and 12, and "N.V. Nederlandse Gasunie: Annual update to credit analysis", September 2019, pp. 2 and 12. Government bond ratings are from Bloomberg.

above, and in line with ACM's method decision for 2017-2021, we select a gearing (D/E) of 80.6%.

Table 10: Current and Historical Credit Ratings

		Country [A]	2020 [B]	2019 [C]	2018 [D]
Elia Group SA/NV	[1]	Belgium	BBB+	BBB+	BBB+
Enagas SA	[2]	Spain	BBB+	BBB+	BBB+
Red Electrica Corp SA	[3]	Spain	A-	A-	A-
REN - Redes Energeticas Nacionais SGPS SA	[4]	Portugal	BBB	BBB	BBB
Snam SpA	[5]	Italy	BBB+	BBB+	BBB+
Terna Rete Elettrica Nazionale SpA	[6]	Italy	BBB+	BBB+	BBB+
TC Pipelines LP	[7]	United States	BBB	BBB	BBB

Notes:
Bloomberg, S&P LT Local Issuer Rating.

VI. The Energy Transition

Over the next decades, it is expected that the use of natural gas in the Netherlands will decrease substantially with a phasing out to be completed by 2050. At the same time, electricity use will increase substantially. The ACM has asked us to assess whether this 'energy transition' could affect the cost of capital in ways that the current methodology does not reflect.

The energy transition could result in a misestimate of the Dutch Gas TSO beta if:

- We expected a change in the beta of the Dutch Gas TSO, but the beta of the peers did not reflect this change, perhaps because energy transition policies differ in the other countries.

- We expected no change in the beta of the Dutch Gas TSO, but the beta of the peers changed as a result of the energy transition.

- Betas of gas and electricity TSOs started to diverge as a result of the energy transition, so that the betas of electricity TSOs no longer generated a good estimate for a gas TSO.

There are broadly two ways that the energy transition could affect the cost of capital of the Gas TSO in the Netherlands and Europe more broadly. First, the expected decline in volumes for the gas network may directly affect the systematic risk faced by the TSOs, and hence affect the TSO's beta. Second, significant differences in future investment requirements between electricity and gas TSOs may create a difference in the asset betas of gas and electricity networks.

With regards to the first issue, we think it is highly unlikely that a decline in volume will affect beta, either for the Dutch TSO or for the peers we use to estimate the beta. Both the Dutch Gas TSO and the peers face limited or no volume risk.[34] If volumes fall, then tariffs will increase to compensate. For the Dutch Gas TSO, the risk for its network assets being stranded is limited, because network assets generally remain in the asset base until they are fully depreciated.[35] Importantly, in the Netherlands the phasing out of natural gas does not imply that there will be no use of the gas network, because it is expected that natural gas will be partly substituted by hydro and green gas. Furthermore, even if there was a risk of assets being stranded, the risk of asset stranding is not likely to be systematic. Rather, the risk of volume decline and asset stranding is related to policy decisions that are independent of the market index. In other words, the risk of volume decline and asset stranding has a 'zero beta'. Accordingly, the risk of volume decline and asset stranding should be dealt by other regulatory mechanisms, not by adjusting the WACC.

The ACM has also asked us to consider the issue of impairments. We understand that some of the stakeholders have expressed concerns that the peer group of companies used in 2016 by Rebel may suffer from impairments – potentially related to the energy transition – while the Dutch Gas TSO may not. The stakeholders believe that this could imply that the peer companies are more risky and have a higher beta than the Dutch Gas TSO. However, similar to asset stranding, the risk of impairments is not likely to be systematic and should not affect beta. Impairments occur when the value of assets falls below the book value. Impairments reflect a decline in value that has already happened and, therefore, they should not affect the share price. Furthermore, impairments are not correlated with the wider economy, and this is also

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[34] All of the European peers are subject to revenue cap regulation and, therefore, face very limited volume risk. The US comparator TC Pipelines operates instead under long-term contracts at FERC-approved rates. However, volume risk is limited, because pipelines can file with FERC for a rate revision if revenues no longer provide a reasonable opportunity to recover costs.

[35] The only exception to this general rule relates to assets that are 'divested', i.e. taken out of the network. The ACM has informed us that in the method decision for the next regulatory period it will change the way it treats divested assets. More specifically, if assets are divested, they will be charged into the tariffs at their efficient cost, whereas the inefficient portion of the historical cost will be stranded. However, if the divested assets are then sold, then 90% of the sale price will be charged to reduce tariffs, compensating users for the efficient cost of the divestment that was charged to tariffs. The other 10% will go to the network operator to provide it with the appropriate incentives to sell at a higher price. In sum, even in the case of asset divestiture, the risk for assets being stranded is limited.

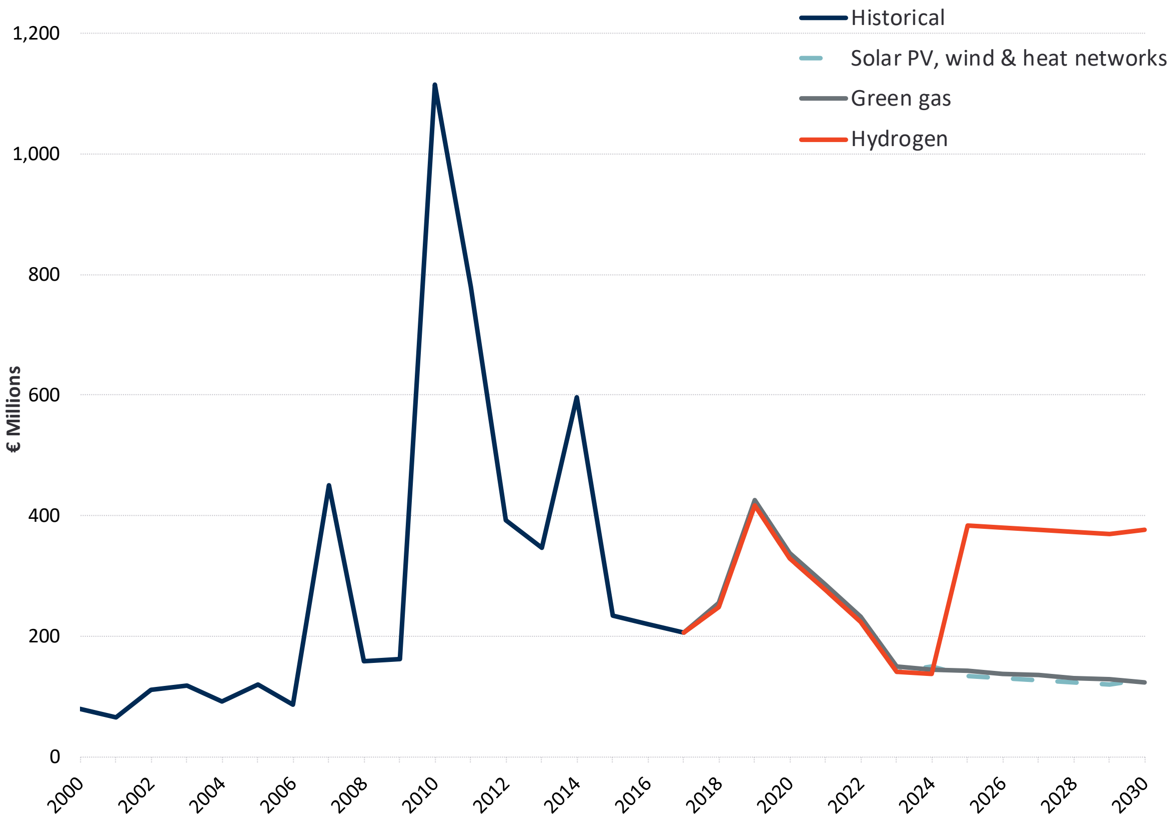
true for impairments linked to the energy transition. Importantly, it is not true that the Dutch Gas TSO does not face any risk of impairments. In 2016, for example, the Dutch Gas TSO reported an impairment of €450 million due to the imposition of a stringent efficiency benchmark in the regulation.

The second way the energy transition could affect the cost of capital of the Dutch Gas TSO relates to the relative size of investments in the electricity and gas networks. In previous work on the WACC of electricity and gas networks, we have always calculated a single asset beta, because the systematic risk of electricity and gas networks was very similar. However, a commitment to make large investments has an effect on the cost of capital similar to that of debt or leverage. Since more cash flows must be reinvested, there is smaller gap between profits and revenues. This means that profits, and hence the firms value, are more sensitive to changes in market conditions in the presence of large investment commitments. 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. Similarly, estimating the asset beta for Dutch electricity networks based on firms with lower investment commitments could result in an underestimate of beta. Conversely, if gas networks will be making relatively little investment, then their asset beta for the next regulatory period may be lower than the betas for past regulatory periods.

To investigate whether energy transition could affect the operating leverage of the Dutch Gas TSO and of the peer group of companies used to estimate the beta, we have analysed the relative size of their historical and planned investments.

With respect to the Dutch Gas TSO, we rely on projections on future investments developed by the Gas TSO in collaboration with the distribution system operators during the MORGAN project (*MOet Regulering Gasnetten ANders*), a program launched by the ACM in 2018 to deal with the potential decrease in gas network use in tariff regulation. The MORGAN project considered investment forecasts under three alternative scenarios, namely (i) solar, wind and heat, (ii) green gas, and (ii) hydrogen. In Figure 5, below, we illustrate historical and expected future investments by the Gas TSO under each of the three scenarios between 2000 and 2030. Overall, while investment is higher in the hydrogen scenario, the future pattern of investments does not reach an extreme level, and is expected to remain relatively stable over the next decade.

Figure 5: GTS investments, by scenario



Source: ACM, Project Morgan.

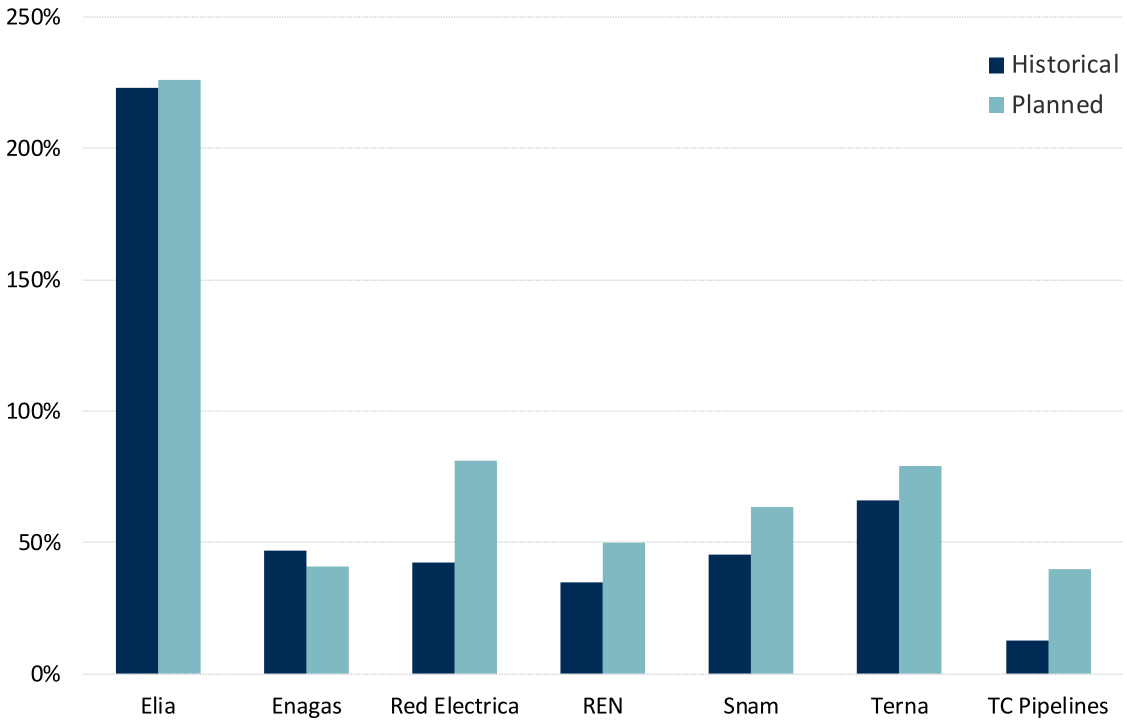
With respect to the peer group of companies, we have retrieved data from their annual accounts and investor presentations over the period 2014-2019 to calculate a measure of historical and forecast investment 'intensity', which we define as the ratio between annual Capital Expenditure (Capex) over Earnings Before Interest Tax Depreciation and Amortisation (EBITDA). In Figure 6, below, we compare the average Capex/EBITDA ratio over the five-year period 2014-2018 with the ratio of average annual forecast Capex over average annual historical EBITDA.[36] Overall, our analysis shows that planned investments are roughly in line with historical investments.[37] This is the opposite of what we would expect as a result of the energy

36 Forecast capex are available for a period of 4-5 years for all peers. Average annual historical EBITDA is calculated over the 2014-2018 period.

37 The analysis focuses more on the *change* than on the *level* of historical and forecast Capex/EBITDA ratio, because the level is influenced by historical EBITDA. With respect to Elia, the only comparator with a ratio exceeding 200%, we have verified that the high value of the ratio is primarily driven by the significant investments made by Elia to finance organic growth. Based on the 'operating leverage' argument, that high levels of investment may lead to a higher beta, we would expect Elia to have a higher beta than the other peers. However, we find that asset beta of Elia (0.39) is in line with the median asset beta in the sample (0.39, see Table 9). This suggests either that other factors are driving Elia's asset beta, or that Elia's operating leverage is still not sufficiently high to affect the asset beta.

transition, where gas TSOs may be expected to invest less as gas consumption declines. We conclude that, at least for the next regulatory period, we do not see a strong shift in investment behaviour as a result of the energy transition.

Figure 6: Historical and planned Capex/EBITDA



Source: Brattle calculations using data from investor presentations and annual accounts 2014-2019.

We conclude that, at least for the next regulatory period, current betas remain a good estimate of future betas. There is no need to adjust the cost of capital methodology as a result of the energy transition.

VII. Cost of Debt

ACM's methodology for calculating the cost of debt in the energy sector makes a distinction between existing capital and new capital.

With respect to the existing capital, the methodology requires to calculate an "embedded" cost of debt based on the 'staircase model'. The staircase model assumes that network operators finance their existing investment with ten-year loans, and refinance 10% of their invested capital every year. Accordingly, the model calculates the embedded cost of debt of a hypothetical loan portfolio, 10% of which was issued in every one of the past 10 years. We find this method reasonable, because it recognises that TSOs finance existing infrastructure with a mix of legacy debt and more recently issued debt, and that the cost of the debt varies over time.

While the cost of debt will always be based on an average of 10-years, the methodology will apply different numbers of 'historical' years and 'future' years, depending on when the WACC will apply. For example, we calculate the cost of debt for the 2022 WACC based on seven historical years (2013-2019) and three future years (2020-2022). We calculate the cost of debt for the 2026 WACC based on three historical years (2017-2019) and seven future years (2020-2026).

For historical years, the methodology takes the average daily yield to maturity of comparable debt in any given calendar year. For future years, the methodology takes the average daily yield to maturity of comparable debt over the three years prior to the measurement date.

With respect to new capital, the methodology requires to calculate the cost of debt based on the forward looking estimate of the cost of debt, thus taking the average daily yield to maturity of comparable debt over the three years prior to the measurement date. Again, this recognises that new capital will be financed with newly issued debt, and that recent debt yields are likely to be a good estimate of future debt costs.

As a measure of comparable debt, we have considered the yield on a utility index of 10-year bonds with a rating of A. A rating of A is consistent with the credit rating of Dutch TSOs and DSOs.[38]

In Table 11, below, we summarise our calculation. For each year between 2012 and 2019, the table reports the average annual yield on the utility index. The Table further reports the average yield for historical and future years for the 2022-2026 WACCs (rows [8] and [9]). Overall, for existing capital we estimate a debt yield between 1.34% for 2022 and 1.03% for 2026. For new capital, we estimate a debt yield of 1.01%.

Table 11: Summary of Yields on Comparable Debt

			Debt Yields				
			2022	2023	2024	2025	2026
2013	[1]		2.70%				
2014	[2]		2.03%	2.03%			
2015	[3]		1.38%	1.38%	1.38%		
2016	[4]		1.00%	1.00%	1.00%	1.00%	
2017	[5]		1.19%	1.19%	1.19%	1.19%	1.19%
2018	[6]		1.36%	1.36%	1.36%	1.36%	1.36%
2019	[7]		0.72%	0.72%	0.72%	0.72%	0.72%
Historical Calendar Years' Average	[8]	Average([1]-[7])	1.48%	1.28%	1.13%	1.06%	1.09%
16 June 2017-15 June 2020 Average	[9]		1.01%	1.01%	1.01%	1.01%	1.01%
Share of loans							
Historical	[10]		70%	60%	50%	40%	30%
New (estimated)	[11]		30%	40%	50%	60%	70%
Total	[12]		100%	100%	100%	100%	100%
Debt yields							
Existing Capital	[13]	[8]x[10]+[9]x[11]	1.34%	1.17%	1.07%	1.03%	1.03%
New Capital	[14]	Equal to [9]	1.01%	1.01%	1.01%	1.01%	1.01%

Notes:
Brattle calculations on Bloomberg data.

ACM's methodology calculates the cost of debt by adding 15 basis points to the yield on comparable debt to account for the cost of issuing debt. This results in a cost of debt for existing capital ranging between 1.49% in 2022 and 1.18% in 2025, and in a cost of debt for new capital of 1.16%.

[38] As of 6 December 2019, the credit rating of Dutch Network companies was between A- and AA based on S&P's rating scale. More specifically, according Moody's outlook for regulated networks, Gasunie, TenneT, Alliander and Enexis had a credit rating of A1 (equivalent to A+), A3 (equivalent to A-), Aa2 (equivalent to AA) and Aa3 (equivalent to AA-), respectively.

Table 12: Pre-tax Cost of Debt

				Existing Capital				
			New Capital	2022	2023	2024	2025	2026
Debt Yield	[1]	Table 10	1.01%	1.34%	1.17%	1.07%	1.03%	1.03%
Non-interest fees	[2]	Assumed	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%
Cost of debt	[3]	[1]+[2]	1.16%	1.49%	1.32%	1.22%	1.18%	1.18%

VIII. Tax and Inflation

The ACM requires to estimate the WACC of the Gas TSO in nominal pre-tax terms, We understand that the current corporate tax rate will be lowered to 21.7% in 2021. Accordingly, we use 21.7% as the applicable tax rate for the next regulatory period, January 2022-December 2026.

The ACM has also asked us to calculate a real WACC. Accordingly, we convert the estimated nominal WACC to a real WACC using an estimate of inflation for the Netherlands.

ACM's methodology for inflation requires to calculate inflation as the average between historic and forecast rates of inflation in the Netherlands.

- As a measure of historical inflation, the methodology requires to calculate the three year average inflation as measured by the CPI in the Netherlands. Over the three-year period May 2017-May 2020, average CPI inflation in the Netherlands was 1.78%.

- As a measure of forecast inflation, we need inflation forecasts for each year of the regulatory period 2022-2026. We use forecast CPI inflation in the Netherlands produced by the Dutch Economic Planning Bureau for 2022-2025, and forecast inflation in 2026 equal to 2025.

Based on this methodology, we arrive at an estimate of inflation of 1.69% for 2022-2026. Our estimate of inflation is constant throughout the regulatory period because CPI inflation in the Netherlands forecast by the Dutch Economic Planning Bureau for the period 2022-2025 is constant. Table 13 summarises.

Table 13: Inflation

Historical CPI inflation, June 2017 - May 2020	[1] See note	1.78%
Forecast Inflation 2022-2026	[2] See note	1.60%
Inflation estimate for 2022-2026	[3] ([1]+[2])/2	1.69%

Notes:
[1]: Average compound inflation between May 2017 and May 2020 from the Dutch Central Planning Bureau (CPB). See CPB, Consumer Prices; price index 2015=100.
[2]: CPB, Forecast CPI inflation for 2022-2025. Inflation in 2026 is assumed equal to 2025. See CPB, Appendices Central Economic Plan 2020 + MLT, March 2020.

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