The Brattle Group

The WACC for the Dutch TSOs, DSOs, water companies and the Dutch Pilotage Organisation

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Final

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1. INTRODUCTION AND SUMMARY

The NMa has commissioned *The Brattle Group* to calculate the Weighted Average Cost of Capital (WACC) for:

1. The Dutch Pilotage Organisation. In the Netherlands Pilotage, being the activity of assisting boats into harbour, is a regulated activity;
2. Dutch Transmission System Operators (TSOs) and Distribution System Operators (DSOs) for electricity and gas;
3. Water distribution companies.

In all cases the purpose of the WACC calculation is to estimate an allowed return in the context of future price controls. The NMa has instructed us to calculate the WACC for the three business activities above according to a methodology which they have developed. In developing the methodology we advised the NMa on the issues of the risk-free rate and the Equity Risk Premium (ERP).[1] However, the final methodology chosen ('the methodology') is the NMa's. The methodology does not distinguish a separate cost of capital for DSOs and TSOs, or for electricity and gas distribution/transmission.

In broad terms, the methodology estimates the WACC by applying the Capital Asset Pricing Model (CAPM) to calculate the cost of equity. The risk-free rate is calculated based on the three-year average yield on 10-year Dutch and German government bonds. The ERP is calculated using long-term historical data on the excess return of shares over long-term bonds, using data from European markets. Specifically, the methodology specifies that the projected ERP should be based on the average of the arithmetic and geometric realised ERP. The methodology also takes note of other estimates of the ERP, from for example, dividend growth models, on deciding whether any adjustments need to be made to the final ERP. In the current case, we have applied the historical ERP without adjustments.

The Dutch firms for which we are estimating the WACC are not publicly traded. Therefore, for each activity, we have selected a 'peer group' of publicly traded firms which derive most of their profits from an activity similar to the one for which we are estimating the WACC. We use the peer groups to estimate the beta for each activity and to inform the appropriate level of gearing.[2] The methodology specifies that the equity betas are estimated using daily betas taken over three years and tested for liquidity and statistical robustness.

We have examined the gearing and credit ratings of network industries in the peer groups and for Dutch network firms. We conclude that a 50% gearing level is a reasonable target for each of the three activities, and that for Dutch regulated firms an S&P 'A' credit rating would be consistent with a 50% gearing.

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[1] See *The Brattle Group* (Dan Harris, Bente Villadsen, Francesco Lo Passo), 'Calculating the Equity Risk Premium and the Risk-free Rate' 26 November 2012. Hereafter referred to as 'the Phase I report'.

[2] Leverage and gearing are usually used interchangeably. Both refer to the percentage of the firm value that is financed by debt, or the market value of debt divided by the sum of the market value of debt and the market value of equity.

The methodology specifies that the allowed cost of debt should be the risk-free rate plus the average spread between the yield on the firms' debt and the risk-free rate over the last three years. To estimate this spread, we use the generic cost of debt for a firm with an A credit rating.

The tables below summarise the WACC for each activity and of the inputs which led to the WACC. The WACCs we calculate are consistent with WACCs estimated in previous price controls, in the sense that most of the changes can be explained by differences in underlying interest rates.

Table 1: Summary WACC calculation

		Transmission	Pilotage	Water	Notes
Risk Free Rate	[1]	2.5%	2.5%	2.5%	See Section 4
Asset Beta	[2]	0.35	0.50	0.27	See Section 6.5
Equity Beta	[3]	0.61	0.88	0.54	[2]x(1+(1-[9])x[11])
ERP	[4]	5.0%	5.0%	5.0%	See Section 6.7
After-tax Cost of Equity	[5]	5.6%	6.9%	5.2%	[1]+[3]x[4]
A-Rated Debt Premium	[6]	1.2%	1.2%	1.2%	See Section 5
Non-interest Fees	[7]	0.15%	0.15%	0.15%	See Section 5
Pre-tax Cost of Debt	[8]	3.9%	3.9%	3.9%	[1]+[6]+[7]
Tax Rate	[9]	25%	25%	0%	Dutch Corporate Tax Rate
Gearing (D/A)	[10]	50%	50%	50%	See Section 3
Gearing (D/E)	[11]	100%	100%	100%	[10]/(1-[10])
Nominal After-tax WACC	[12]	4.2%	4.9%	4.5%	(1-[10])x[5]+(1-[9])x[8]x[10]
Inflation	[13]	2.0%	2.0%	2.0%	See Section 8
Nominal Pre-tax WACC	[14]	5.6%	6.5%	4.5%	[12]/(1-[9])
Real Pre-tax WACC	[15]	3.6%	4.4%	2.5%	(1+[14])/(1+[13])-1

2. SELECTION OF PEER GROUPS

The Dutch firms for which we are estimating the WACC are not publicly traded. Therefore for each activity we need to find publicly traded firms which derive the majority of their profits from the activity for which we are trying to estimate the WACC. We call these firms 'comparables' or 'peers'. We define a group of peers or a 'peer group' for each activity. We use the peer groups for two key steps in the WACC calculation:

1. Estimating the beta for the activity;
2. Estimating the appropriate level of debt for the regulated activity.

We first identify a group of potential peers. We then apply test to see if the firms' shares are sufficiently liquid before deciding on the final peer group. As a starting point we base our potential peers on firms that have been previously identified in consultant reports for the NMa.[3]

In determining the number of peers that should be in each peer group, 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 firm, which makes the beta estimate worse. In statistical terms, once we have 6-7 peers in the group the reduction in the error from adding another firm is relatively small. Therefore a peer group of around six firms should ensure an acceptable level of accuracy while avoiding adding firms which are not sufficiently similar to the activity in question.

For the energy network activity, the methodology requires at least ten companies in the peer group. We understand that the requirement for ten firms in the peer group is so that the group represents a sufficiently diverse range of regulatory regimes. To reach the requirement of ten comparators for each activity we first attempt to include companies involved in similar business lines in the EU. If this is not sufficient we use peers from other regulated businesses from for the US.[4] For the TSO/DSO activity we have found six listed TSO/DSO firms in the EU which could be suitable peers. We include three companies from the US to make the peer group up to the required 10 firms. We chose US firms with a high proportion of revenues derived from price-controlled gas transport activities.

For the water companies, the only European comparators which meet the criteria for inclusion set by the methodology are four UK water companies.[5] To increase the group to six, and therefore reduced the error in the beta estimate, we add two water companies from the US.

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[3] Oxera, *"Estimating the Cost of Capital of the Dutch Water Companies – Prepared for the Dutch Ministry of Infrastructure and Environment"*, March 11, 2011. (Hereafter: Oxera Water Report)
Frontier Economics, *"Research into Updating the WACC for Dutch Pilotage - A Report Prepared for the NMa"*, November 2011. (Hereafter: Frontier Report)
Oxera, *"Cost of Capital for GTS: Annual Estimates from 2006 onwards – Prepared for the NMa"*, May 2011. (Hereafter: Oxera GTS Report)

[4] However, we recognise that US firms have a different regulatory regime than EU firms.

[5] Oxera Water Report, Footnote 22, p.18.

We have not used water companies from outside of the US and the EU. This is because we are not confident that the relationship between the share prices of such firms and the local market index will be representative of the relationship for a water firm in the EU. Hence beta estimates for such firms may not be a reliable estimate for a beta of a water firm in the Netherlands.

Table 2: Firms Selected as Potential Peers

Firm	Country	Transmission	Pilotage	Water
Energy				
Snam Rete Gas	Italy	✓	✓	
Terna	Italy	✓	✓	
REN	Portugal	✓	✓	
Red Electrica	Spain	✓	✓	
Enagas	Spain	✓	✓	
National Grid	UK	✓	✓	
Elia	Belgium	✓	✓	
Northwest Natural Gas Co	US	✓		
Piedmont Natural Gas Co	US	✓		
TC Pipelines LP	US	✓		
Ports				
Sutton Harbour Holdings	UK		✓	
Forth Ports	UK		✓	
Hamburger Hafen und Logistik AG	Germany		✓	
Water				
Severn Trent	UK		✓	✓
Pennon Group	UK		✓	✓
Northumbrian Water Group	UK		✓	✓
United Utilities Group PLC	UK		✓	✓
California Water Service	US			✓
SJW Corp	US			✓

For pilotage, there are no publicly traded firms which engage in a similar activity. Revenues for the pilotage activity in any particular year depend on the volume of maritime trade, for instance in the port of Rotterdam. However, the defining feature of the pilotage activity relevant to the calculation of beta is that it is a regulated monopoly which does not face any competition, and has the ability to pass through its costs to its customers. The Pilotage Organisation faces very little revenue risk, because it can adjust its tariffs every year so that they cover the organisation's costs. If volumes are lower than were forecast at the time the Pilotage Organisation's prices were set, then it can increase its tariffs to account for the lower volumes in the following year. Hence, while the Pilotage Organisation is engaged in a maritime activity, the systematic risk of the business – that is, the risk that is correlated with the market index – will more closely resemble that of other regulated businesses such as water and energy networks.

Arguable, the systematic risk of the Pilotage Organisation is even lower than the risk of energy networks and water, because unlike most regulated energy firms which have a price control only every three or four years, the Pilotage Organisation can change its tariffs every year. Moreover we understand that pilotage has a relatively low level of fixed costs (in other words, its operating gearing is low), which further reduces the systematic risk of the business relative to a network firm with higher operating gearing. Accordingly, the main reference group for the Pilotage Organisation should be water and energy networks, because both businesses are regulated with little volume risk, and it is the presence of regulated tariffs that define the systematic risk, and hence the beta for the Pilotage Organisation.

Ports offer another possible comparator for the Pilotage Organisation. Like pilotage, ports' profits will vary with the volume of international maritime trade. However unlike pilotage, most ports have a limited ability to pass through their costs to customers in the face of decreased demand. Hence we would expect the beta for ports to be significantly higher than the true beta for pilotage. For example in an economic depression, the share price of a port would fall with the market index, as the port faces reduced revenues. In contrast, the value of the Pilotage Organisation is not affected, as it can simply raise prices to offset the fall in demand. This means that the beta of the port will be higher than the notional beta for the Pilotage Organisation. Using a beta for the Pilotage Organisation based only on ports would reward investors in the Pilotage Organisation for risks which they were not in fact bearing. The regulated nature of the Pilotage Organisation's prices business relieves the investors of much of the systematic risk of a business that cannot pass through cost increases.

Notwithstanding this point, on a practical level there are few publicly traded ports in the EU which are suitable for use as peers. The already small sample has been further reduced because two of the ports used in the Frontier report are in Greece. Given the crisis in Greece, it seems likely that the current betas for Greek ports may not be reliable.[6] We were only able to find two UK ports in the potential peer group for pilotage. Since the last version of the report, based on comments from stakeholders we have added a German port to the sample. We have searched for publicly traded ports in the US to increase the number of ports in the sample. Some US ports are owned by publicly traded firms. However, the parent companies also own other non-port activities, and/or own ports outside of the US. Therefore for these firms it would not be clear which market index we should use to estimate a beta. Moreover, the level of global diversification which these firms enjoy is not similar to the diversification of the pilotage organisation, which operates only in the Netherlands.

The Frontier report extended the sample of ports by using publicly traded ports in New Zealand and China. When estimating the beta for these peers, we would have to estimate beta by reference to the local market index. Our concern is that the relationship between the Chinese market index and a Chinese port's stock price might be very different from the equivalent relationship in Europe, because the Chinese economy is so different from Europe's. For example, the Chinese economy is more dependent on trade than the Eurozone economy, and has a different mix of activities such as service industries, manufacturing and agriculture. Hence the relationship between the share price of a

[6] Another possibility would have been to calculate a beta for Greek ports using pre-crisis data. However, we understand that a recent Court decision requires the regulator to use the latest data available, so in this case this option was discounted.

Chinese port and the Chinese market index will be different to the relationship between a European port and the European market index. In our first report for NMa we described how the relevant market index is the Eurozone index, because a typical Dutch investor would be diversified across the Eurozone, not just in the Netherlands.[7] For this investor the relevant benchmark is the way that an individual firm's share price behaves relative to a Eurozone index, since this tells the investor about the degree of systematic risk he or she is bearing. The relationship between a Chinese port's share price and the Chinese index is not relevant for the European investor, because it does not tell the Dutch investor about the risk of the Pilotage Organisation relative to the Eurozone market index which he or she is using to diversify risk. For this reason, we have not considered data from publicly traded ports outside of the EU and the US.

In previous WACC decisions, the consultants also used other maritime activities, such as shipping, in the pilotage peer group. However, we agreed with the NMa that these activities were not sufficiently close to the pilotage activity, mainly because they were much more exposed to competition than the pilotage activity, which is a statutory monopoly. Competition reduces the ability of firms to pass through their costs when demand falls. This means that firms in more competitive industries will tend to have higher betas. As demand drops during an economic downturn, the business may be forced to reduce prices and even operate at a loss. The more competitive the sector, the larger price reductions the firms in that sector will need to make as demand falls. Hence the share prices of these firms will tend to follow the market index more closely, which results in a higher beta.

Ports also face competition, which is one of the reasons that we think they are of limited value of estimating the beta for the Pilotage Organisation, which is a statutory monopoly. However qualitatively it would seem that some ports may face more limited competition where they have a natural geographic advantage. For example, we understand that Rotterdam is the only port in North-West Europe providing deep water access. Hence for imports or exports involving very large ships the Port of Rotterdam may have some pricing power. The further away the next alternative deep-water port is, the more pricing power the port will have. In contrast maritime shipping services have no geographic advantage, and so arguable face more competition. Hence the beta for shipping firms would likely be higher than the Pilotage Organisation's true beta. For this reason is seems more relevant to include ports in the peer group for the Pilotage Organisation, but not to include maritime companies more generally.

We give the ports, water distribution or energy networks activities equal weight in the pilotage peer group. This means that regulated firms (water distribution and energy networks) contribute two-thirds of the sample for the peer group of the Pilotage Organisation. This seems reasonable given that, in our view, the overriding feature of the Pilotage Organisation with respect to beta is its ability to pass through its costs to its customers and raise prices in the face of falling demand, in a manner similar to that of regulated networks. This feature of the Pilotage Organisation business should be given significantly more weight than the fact that the business is related to maritime trade.

[7] *Loc. Cit.* footnote 1.

Hence the beta for the pilotage peer group will be calculated as the simple average of the median beta for ports, the median beta for water distribution and the median beta of the energy networks. We apply the same approach to estimating a suitable gearing for the pilotage activity.

2.1. LIQUIDITY TESTS

One of the things that we use the peer group for is estimating the beta for each activity. Illiquid stocks will tend to underestimate a beta, and so we first test each firm to see if its shares are sufficiently liquid.[8] There are several possible tests for the liquidity of a traded share. One test defines a share as being sufficiently liquid for the purposes of estimating beta using daily returns if it trades on more than 90% of days in which the index trades. This test has been applied for the NMa in previous reports.[9] We have applied this test to our prospective peer groups – Table 3 shows the results.

Table 3: Summary of liquidity tests

Company	% of days that the company trades	Average daily value traded
Snam SpA, €	98%	35,904,548
Terna Rete Elettrica Nazionale SpA, €	98%	29,896,064
REN - Redes Energeticas Nacionais SGPS SA, €	99%	637,491
Red Electrica Corp SA, €	98%	39,014,220
Enagas SA, €	98%	31,141,711
National Grid PLC, €	97%	57,551,453
Elia System Operator SA/NV, €	99%	938,190
Sutton Harbour Holdings PLC, €	79%	23,964
Forth Ports PLC, €	97%	1,560,460
Hamburger Hafen und Logistik AG, €	98%	3,276,503
Severn Trent PLC, €	97%	14,075,553
Pennon Group PLC, €	97%	8,018,467
Northumbrian Water Group PLC, €	97%	4,903,145
United Utilities Group PLC, €	97%	19,214,808
Kinder Morgan Energy Partners LP, US$	100%	53,904,597
Northwest Natural Gas Co, US$	100%	5,919,474
Piedmont Natural Gas Co Inc, US$	100%	10,178,437
TC Pipelines LP, US$	100%	2,450,595
California Water Service, US$	100%	4,069,323
SJW Corp, US$	100%	783,476

Notes:
Average volume traded over 3 years of data used in analysis

[8] For example, suppose that the true beta of a firm was 1.0, so that every day the firm's true value moved exactly in line with the market. But the firm's shares only change price when they are traded. 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 fewer 80% less data points over any given period.

[9] Oxera Water Report, p.11; Frontier Report, p.22; Oxera GTS Report, p.19.

Of the potential peers only Sutton Harbour is significantly lower than the threshold of 90% trading. Accordingly we reject Sutton Ports as too illiquid to give an accurate representation, and exclude it from the Pilotage peer group. However, this leaves only one port in the pilotage peer group, confirming the need to include energy and water peers.

We note that though the firms Elia, REN and SJW pass the threshold on number of trading days, the average trading value per day is noticeably lower than the other firms.[10] We have also checked that all the firms in the peer groups have annual revenues of at least €100 million.

[10] Nevertheless we include them in the peer group.

3. GEARING AND CREDIT RATING

Our first step is to look at the gearing levels of the firms in the peer groups. Table 4 illustrates the weighted average gearing of the peer groups for energy networks, water distribution and pilotage are very similar at 47%, 50% and 43% respectively.[11]

Table 4: Average gearing (D/A) of the peer groups

Firm	Country	Transmission	Pilotage	Water
Energy				
Snam SpA	Italy	51%	51%	
Terna Rete Elettrica Nazionale SpA	Italy	50%	50%	
REN - Redes Energeticas Nacionais SGPS SA	Portugal	70%	70%	
Red Electrica Corp SA	Spain	49%	49%	
Enagas SA	Spain	48%	48%	
National Grid PLC	UK	45%	45%	
Elia System Operator SA/NV	Belgium	55%	55%	
Northwest Natural Gas Co	US	41%		
Piedmont Natural Gas Co Inc	US	38%		
TC Pipelines LP	US	25%		
Ports				
Forth Ports PLC	UK		27%	
Hamburger Hafen und Logistik AG	Germany		15%	
Water				
Severn Trent PLC	UK		53%	53%
Pennon Group PLC	UK		50%	50%
Northumbrian Water Group PLC	UK		57%	57%
United Utilities Group PLC	UK		57%	57%
California Water Service Group	US			41%
SJW Corp	US			41%
Minimum		25%	15%	41%
Maximum		70%	70%	57%
(Weighted) Average		47%	43%	50%

Source: Bloomberg
Gearing is as of the latest date used in the analysis period for each firm

We also note that there are some external constraints on the choice of gearing. Bank debt covenants will require gearing to remain below certain levels. Dutch law requires network firms to

[11] Since the peer group for Pilotage is made up of one-third of ports, water and energy networks, we calculate the average gearing for Pilotage as the simple average of the Forth Ports Gearing, the average energy networks gearing and the water distribution firms' gearing.

maintain an investment grade credit rating, or to maintain financial parameters that are broadly consistent with an 'investment grade' rating, which is an S&P rating of at least BBB-.[12]

Figure 1 illustrates the relationship between credit ratings and gearing for a range of regulated firms.[13] From the sample below, there is not a clear relationship between credit rating and gearing. The average gearing of the A rated firms is 46%, while the average gearing of firms rated BBB is 44%. This is because gearing is only one factor which drives credit ratings. Other factors include the sector in which the firm is active and the countries in which it operates. The latter has become particularly critical since the emergence of the sovereign debt crisis in the Eurozone. That there is no significant difference between the gearing of A rated and BBB rated companies confirms that factors other than gearing are driving the differences in credit ratings. In particular, the only regulated European BBB rated companies are Spanish. The BBB ratings reflect the weakening of the Spanish economy, and that Enagas and Red Electrica have been recently downgraded to match the rating of the Spanish Government. This also highlights that it is of limited use to compare the ratings of network firms operating in different European countries.

In contrast, The Dutch government has maintained its AAA rating. Gasunie, which is the parent company of GTS, had a long-term S&P credit rating of AA- with a negative outlook as of end February 2013.[14] Unfortunately deriving a gearing for GTS is difficult, since the debt is held by the parent, Gasunie, and is used to finance both regulated and non-regulated activities. TenneT notes on its website that it aims to maintain a credit rating of at least A. TenneT's 2011 gearing, based on net debt and book equity, was 48%.[15] Enexis and Alliander are two energy supply and network companies active in the Netherlands. Both have an S&P rating of A+ based on recent gearing of 41% and 37% respectively. Given the data above, we conclude that all the peer groups have a very similar gearing in the range of 45-50%.

In the past other EU regulators have allowed slightly higher gearing levels – up to around 65% – in their WACC calculations. However since 2008 firms have generally had to hold less debt to maintain an investment grade rating. Targeting an A grade rating – which is the last-but-one credit rating before debt loses its investment-grade status – seems prudent given the requirements of Dutch law.

We note that the final WACC results are not sensitive to the choice of gearing, as long as the firms maintain an A credit rating. As gearing increases, the proportion of relatively cheap debt in the WACC formula increases. However, increased debt means more risk for equity holders, which results in a higher equity beta and a higher cost of equity. These two effects offset one another almost exactly.[16] For example, we estimate that for the energy activity, as the assumed gearing changes from

[12] Besluit van 26 juli 2008, houdende regels ten aanzien van het financieel beheer van de netbeheerder (Besluit financieel beheer netbeheerder), Op de voordracht van Onze Minister van Economische Zaken van 24 juni 2008, nr. WJZ8070077.

[13] Latest ratings given by S&P; latest gearing from Bloomberg.

[14] http://www.gasunie.nl/en/about-gasunie/credit-ratings visited on February 27, 2013.

[15] Debt-to-RAB is a usually a good approximation for gearing for non-listed firms, since the RAB should approximate the value of debt plus the market value of equity.

[16] The insensitivity of the WACC to the financing choices under certain assumption is known as the Modigliani–Miller theorem.

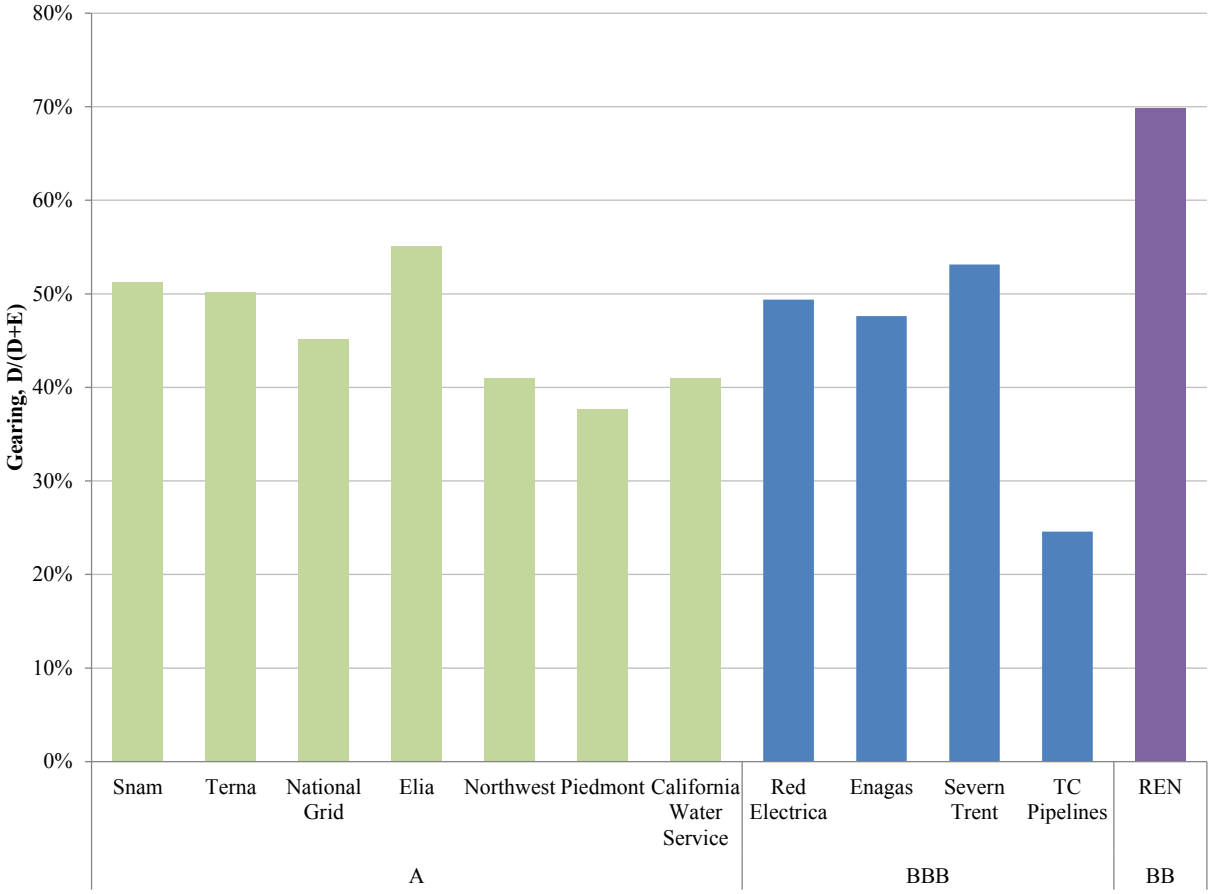
40% to 60% (with a constant cost of debt) the after tax nominal WACC only changes from 4.172% to 4.165%. This illustrates that as long as the target level of debt and the credit rating assumed are consistent with one another, and the credit rating is reasonable given that the country in which the firms operate, then the resulting WACC should be reasonable.

Given the observed gearing levels of between 45-50%, the need to maintain an A credit rating and the relative insensitivity of the WACC to the final choice of gearing (as long as it consistent with an A rating), a gearing level of 50% is consistent with an A credit rating for regulated firms operating in the Netherlands. This level of gearing and the target credit rating are consistent with actual practice of the Dutch network firms for which credit ratings are available, and are below what we understand to be the maximum gearing allowed by the debt covenants for the Pilotage Organisation.[17] In the Appendix II we discuss in more detail that the 50% gearing is consistent with an A rating, by looking at the criteria set out in the Moody's credit rating guide for regulated gas and electricity network companies. Because the water companies and the Pilotage Organisation have very similar business risks to regulated gas and electricity networks, it is reasonable to suppose that they too would obtain at least an A credit rating, and the associated cost of debt, with a 50% level of gearing.

Note that we use a 50% gearing, rather than the average peer group gearing in Table 4, because using slightly different gearings for each sector gives a false impression of accuracy. For a constant cost of debt there is a range of gearing and the WACC is insensitive to the actual gearing assumed. It is standard regulatory practice to apply a level of gearing rounded to the nearest 10%. When establishing credit ratings, Moody's applies relatively broad ranges of gearing. According to Moody's, a gearing within the range of 45-60% qualifies for an A rating.[18]

[17] Provided by NMa, based on information from Pilotage Organisation.
[18] Moody's Global Infrastructure Finance, "Regulated Electric and gas Networks", August 2009, p.20.

Figure 1: Gearing vs S&P Credit Rating

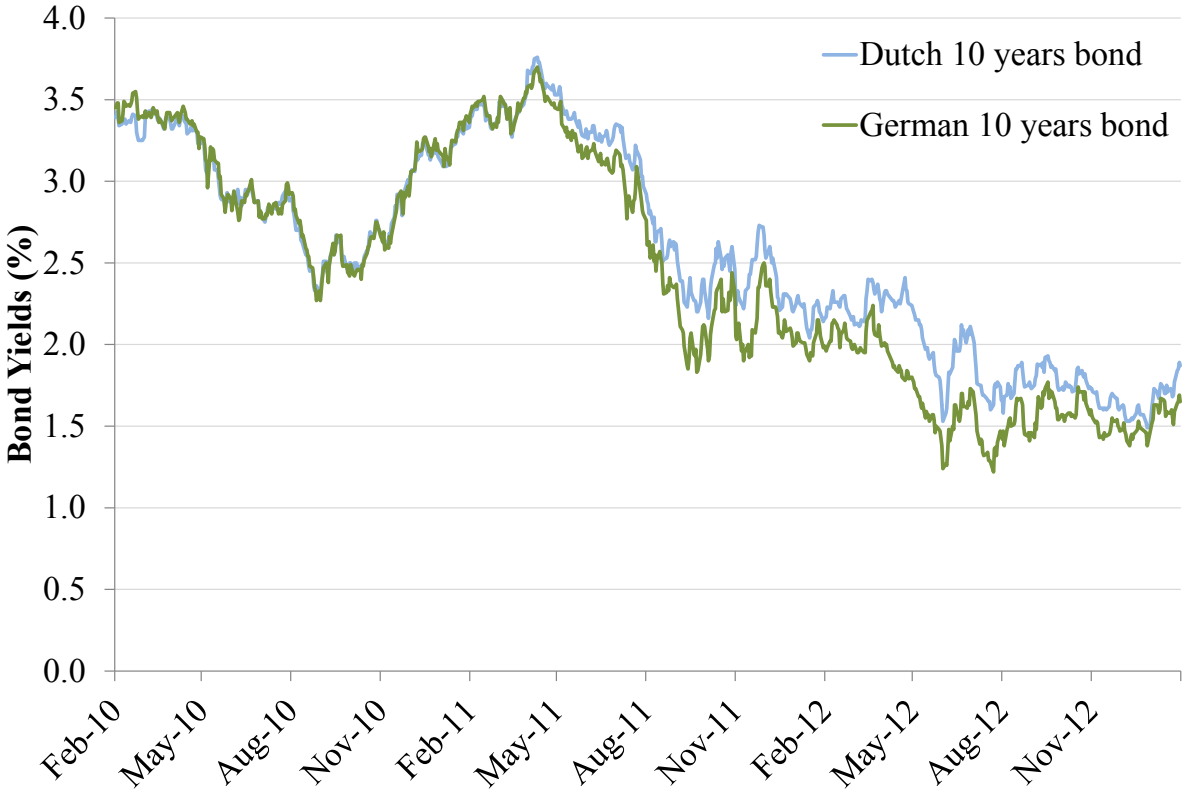


4. RISK-FREE RATE

The methodology specifies risk-free rate based on a three-year average of the 10 year German and Dutch government bonds. As discussed in the Phase 1 report for the NMa, the method uses a simple average between Dutch and German bonds because this reflected a fair trade-off between choosing a truly risk-free rate on the one hand and considering the extra information that Dutch bonds give about country-risk on the other. Figure 2 below shows the movement of the bond yields over the prior three years. We note that, as a result of the economic crisis and subsequent easing of monetary policy, the risk free rate has declined substantially over the three year reference period.

The three-year average yield is 2.59% for the 10-year Dutch government bond and 2.46% for the 10-year German government bond. This yields a simple average risk-free rate of 2.5%.

Figure 2: Yield on Dutch and German Government 10 Year Bonds



5. COST OF DEBT

To estimate a cost of debt for the regulated firms, we consider the yield on debt issued by other A rated European companies. The methodology specifies that the allowed cost of debt is the average spread of the regulated firms' debt over the risk-free rate over the last three years. Accordingly, the period over which the spread is averaged is consistent with the period over which the risk-free rate is calculated.

Figure 3 illustrates the spread of rated debt with 10 years maturity above the German risk free rate. We note that the 3 year time horizon misses the major impacts of the crisis caused by the Lehman collapse in September 2008.

The yield spread on A-rated debt has remained reasonable stable over the three year reference period, moving in a band between 1.0.-1.5%. While the yield spread on BBB+ Industrial debt has been more volatile, is has recently narrowed to become similar to that of A rated Utilities. BBB rated debt has also recently narrowed but maintained a small premium; the data available as of end January 2013 indicates that the spread of BBB rated industrials is 0.7% above that of A rated industrials.

Figure 3: Yield Spread on European Rated Debt[19]

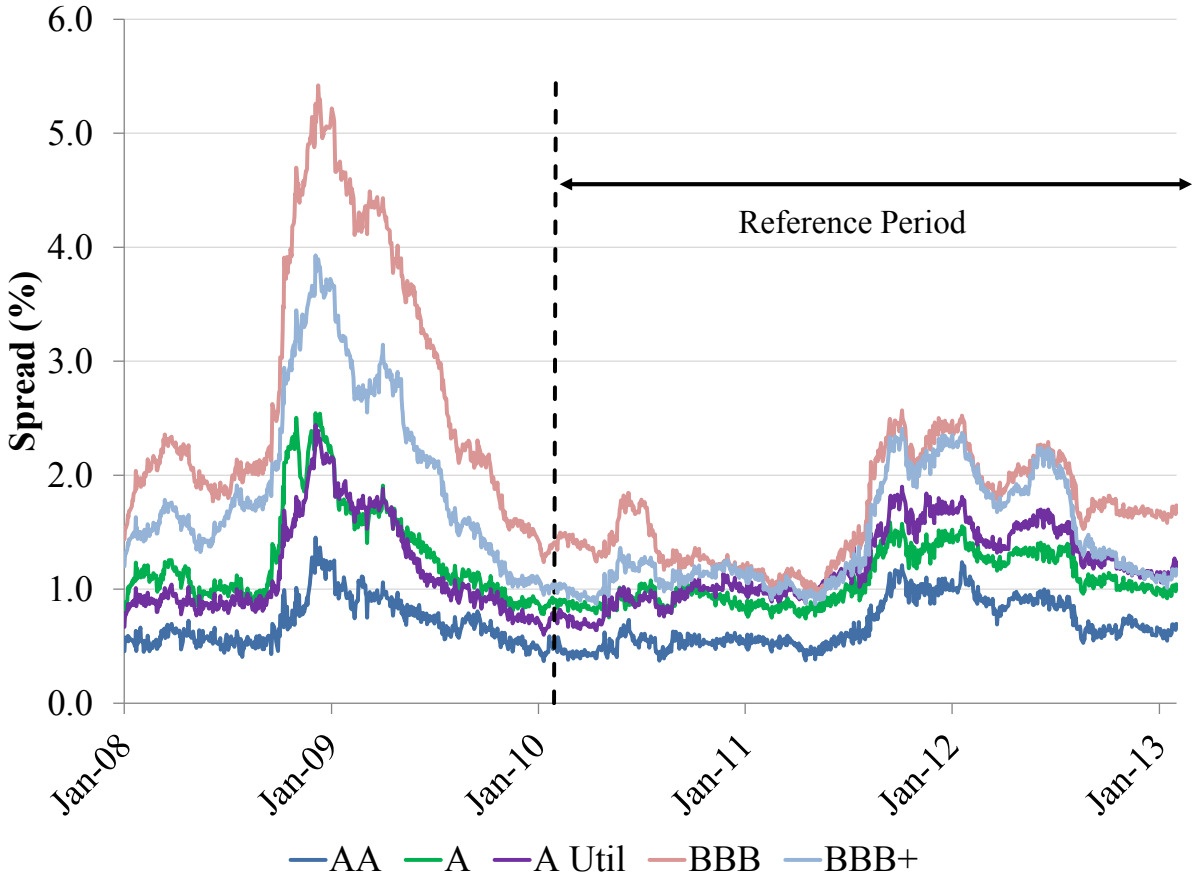


Table 5 below summarises the average of the three year spread for each rating band and gives some comfort that final allowed cost of debt is not currently highly sensitive to the choice of credit rating.

Table 5: Three-year Average Spread on Rated European Companies

AA Industrial	0.68%
A Industrial	1.07%
A Utility	1.20%
BBB Industrial	1.65%

Source: Bloomberg

We calculate that the average spread of the yields over the risk free rate for the past three years for A rated utilities is 1.2%. We apply this spread to the risk free rate to give an overall cost of debt for the regulated firms. Following the methodology, an additional premium of 15 basis points is added to account for issuance fees and other non-interest costs of debt. The above calculations result in a cost of debt of 3.9%. Table 6 illustrates the cost of debt calculation.

[19] Source: Bloomberg.

Table 6: Allowed Cost of Debt

Risk Free Rate	[1]	2.52%	
Spread of A-rated	[2]	1.20%	
Non-interest Fees	[3]	0.15%	
Cost of Debt	[4]	3.87%	[1]+[2]+[3]

6. COST OF EQUITY

The methodology specifies that the cost of equity will be estimated by applying the Capital Asset Pricing Model. The CAPM expresses the cost of equity for a business activity as the sum of a risk-free rate and a risk premium. The size of the risk premium depends on the systematic risk of the underlying asset, or project, relative to the market as a whole.[20]

In the case of the regulated activities in the Netherlands, the systematic risk of each of the regulated businesses cannot be measured directly. The regulated Dutch firms are not listed on a stock exchange making it impossible to measure the covariance of firm value against the movement of the market as a whole. Accordingly, we for each activity we identify a peer group of firms which are publicly traded and derive the majority of their profits from the activity in question.

6.1. MARKET INDICES

The relative risk of each company must be measured against an index representing the overall market, defined as the covariance of returns between the company and the chosen market index. The methodology specifies a broad Eurozone index for the European companies, and a national index for the US companies. Our Phase I report for the NMa discusses the reasons for the use of a Europe wide index in more detail, but in essence the idea is that the typical investor in a Dutch utility would be diversified across Europe. Since the Phase I report, we have refined the methodology to say that the investor would be diversified in particular across the Eurozone, because this would eliminate exchange rate risk.[21] Therefore a Eurozone index is the correct reference point for measuring the systematic risks of the activity.

6.2. PEER GROUP EQUITY BETAS

The methodology specifies a three year daily sampling period for the beta. Table 7 details the unadjusted or 'raw' equity betas.

We note that of the previously identified firms, both Forth Ports and Northumbrian water were acquired in 2011 so we use the latest data before any announcement of takeover occurred.[22] The

[20] Further information on assumptions and theory underlying the CAPM can be found in most financial textbooks; see Brealey, Myers, Allen, *"Principles of Corporate Finance"*.

[21] *Loc. Cit.* footnote 1.

[22] The takeover of Northumbrian Water was announced on the 27th of June; Forth Ports on the 7th of March. All data after and including these dates is excluded.

announcement of a take-over will cause stock movement which will not reflect the underlying asset and should be excluded.

Table 7: Raw Equity Betas

	Country	3 Yr Beta	SE	Low	High
Energy					
Snam	Italy	0.56	0.03	0.47	0.59
Terna Rete Elettrica Nazionale	Italy	0.55	0.03	0.46	0.58
REN - Redes Energeticas Nacionais	Portugal	0.34	0.03	0.28	0.40
Red Electrica	Spain	0.83	0.04	0.74	0.89
Enagas	Spain	0.82	0.04	0.72	0.86
National Grid	UK	0.34	0.03	0.28	0.40
Elia System Operator	Belgium	0.24	0.03	0.18	0.28
Northwest Natural Gas	US	0.74	0.03	0.69	0.79
Piedmont Natural Gas	US	0.89	0.03	0.80	0.91
TC Pipelines	US	0.39	0.04	0.31	0.44
Ports					
Forth Ports	UK	0.95	0.05	0.87	1.07
Hamburger Hafen AG	Germany	0.95	0.04	0.88	1.02
Water					
Severn Trent	UK	0.39	0.03	0.29	0.41
Pennon Group	UK	0.42	0.03	0.33	0.45
Northumbrian Water Group	UK	0.44	0.03	0.44	0.57
United Utilities Group	UK	0.36	0.03	0.28	0.40
California Water Service	US	0.78	0.03	0.71	0.82
SJW Corp	US	1.09	0.04	0.99	1.16

6.3. THE DIMSON ADJUSTMENT

When calculating betas using daily returns, there is a risk that the response of a firm's share price may appear to react to the market index the day before or the day after. This could occur because of differences in market opening times and trading hours, or differences in the liquidity of the firm's shares vs. the average liquidity of the market. If such an effect is present, it could affect a beta which is calculated using only the correlation between the return on the firm's share on day D and the return on the market index on the same day.

The "Dimson" adjustment is a standard test which deals with this effect. The Dimson adjustment estimates betas by performing the same regression against the market index as for a standard beta, but uses the company returns from either one day ahead or one day before that of the market.[23] If the

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

market is perfectly efficient, then all information should be dealt with on the same day, so that a beta measured using the company returns from either one day ahead or one day before that of the market index return should be uncorrelated, giving a beta of zero. A beta significantly different from zero[24] suggests that information about the true beta may be contained in trading the day before or after the day for which the market return is calculated.

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

We have performed this test for the firms in our peer groups. The results are presented in Table 8. We note that the adjustment is significant for five firms out of the total sample, suggesting that information on systematic risk is contained within the adjacent days.

We perform a further series of standard diagnostic tests to assess if the beta estimates satisfy the standard conditions underlying ordinary least squares regression, which are outlined in the Appendix. Once we have applied the corrections the betas should be robust to autocorrelation and heteroskedasticity.

[24] Significance is taken at the 5% level.

Table 8: Dimson Adjustments

	3 yr			
	OLS Beta	Dimson Beta	Dimson Standard Error	Significance
Energy				
Snam	0.56	0.52	0.05	
Terna Rete Elettrica Nazionale	0.55	0.55	0.05	
REN - Redes Energeticas Nacionais	0.34	0.32	0.05	
Red Electrica	0.83	1.02	0.07	Significant Dimson
Enagas	0.82	1.00	0.06	Significant Dimson
National Grid	0.34	0.41	0.05	
Elia System Operator	0.24	0.32	0.04	
Northwest Natural Gas	0.74	0.64	0.05	Significant Dimson
Piedmont Natural Gas	0.89	0.76	0.05	Significant Dimson
TC Pipelines	0.39	0.50	0.06	
Ports				
Forth Ports	0.95	1.13	0.09	
Hamburger Hafen AG	0.95	1.21	0.07	Significant Dimson
Water				
Severn Trent	0.39	0.45	0.06	
Pennon Group	0.42	0.46	0.06	
Northumbrian Water Group	0.44	0.56	0.06	Significant Dimson
United Utilities Group	0.36	0.37	0.05	
California Water Service	0.78	0.58	0.05	Significant Dimson
SJW Corp	1.09	0.86	0.07	Significant Dimson

6.4. VASICEK CORRECTION

The methodology applies the Vasicek adjustments to the observed equity betas. This adjustment takes account of a prior expectation of the equity beta. In this case, we have used a prior expectation of the beta of 1.0, which is the market average. We considered applying the critique of Lally,[25] which among other things argues for using a prior expectation of the beta which is specific to the activity in question. However, we could find no objective way of determining the prior expectation of beta. Accordingly, we have adopted the more neutral assumption of the prior expectation of a prior expectation of beta of 1.0.

[25] Lally, Martin, *"An Examination of Blume and Vasicek Betas"*. Financial Review, August 1998.

The Vasicek adjustment moves the observed beta closer to 1 by a weighting based on the standard error of the beta, such that values with lower errors will be given a higher weighting. The prior expectation of the Beta given in other consultant reports is 1, which we apply here. For the prior expectation of the standard error we use the standard error on the overall market.[26] Table 9 illustrates the effect of the Vasicek adjustment.

Table 9: Effect of the Vasicek adjustment

Company	Country	Estimate of Beta	Standard Error	Vasicek Beta
Energy				
Snam SpA	Italy	0.56	0.03	0.56
Terna Rete Elettrica Nazionale SpA	Italy	0.55	0.03	0.56
REN - Redes Energeticas Nacionais SGPS SA	Portugal	0.34	0.03	0.35
Red Electrica Corp SA	Spain	1.02	0.07	1.02
Enagas SA	Spain	1.00	0.06	1.00
National Grid PLC	UK	0.34	0.03	0.34
Elia System Operator SA/NV	Belgium	0.24	0.03	0.25
Northwest Natural Gas Co	US	0.64	0.05	0.64
Piedmont Natural Gas Co Inc	US	0.76	0.05	0.76
TC Pipelines LP	US	0.39	0.04	0.40
Ports				
Forth Ports PLC	UK	0.95	0.05	0.95
Hamburger Hafen und Logistik AG	Germany	1.21	0.07	1.20
Water				
Severn Trent PLC	UK	0.39	0.03	0.40
Pennon Group PLC	UK	0.42	0.03	0.43
Northumbrian Water Group PLC	UK	0.56	0.06	0.57
United Utilities Group PLC	UK	0.36	0.03	0.36
California Water Service Group	US	0.58	0.05	0.59
SJW Corp	US	0.86	0.07	0.86

Notes: The betas are adjusted to a prior estimate of 1. The prior estimate of Standard Error is assumed to be the market standard error. This is 0.36 for the European companies and 0.39 for the US companies.

6.5. PEER GROUP ASSET BETAS

The measured equity beta measures the relative risk of each company's equity, which will reflect the financing decisions specific to each company. As debt is added to the company the equity will

[26] The standard error on the FTSE 100 index is used as a proxy for the European market, and is reported by the LBS. Valueline reports the standard deviation of all stocks in the US market.
As we are using the market average beta for our prior expectation, it is consistent to use the standard deviation of the distribution of the betas underlying the market population as the prior expectation of the standard error.

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 firm 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 a more gearing, that firm will also have a higher beta than the firm with lower gearing.

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.[27] Table 10 illustrates both the equity beta and the asset betas for each firm.

Table 10: Equity and Asset betas

Firm	Gearing (D/E) [A] Bloomberg	Equity Beta [B] Section 5.6	Tax Rate [C] KPMG	Asset Beta [D] See Note
Energy				
Snam SpA	90%	0.56	31.4%	0.35
Terna Rete Elettrica Nazionale SpA	92%	0.56	31.4%	0.34
REN - Redes Energeticas Nacionais SGPS SA	184%	0.35	25.0%	0.15
Red Electrica Corp SA	100%	1.02	30.0%	0.60
Enagas SA	92%	1.00	30.0%	0.61
National Grid PLC	101%	0.34	28.0%	0.20
Elia System Operator SA/NV	146%	0.25	34.0%	0.13
Northwest Natural Gas Co	63%	0.64	40.0%	0.46
Piedmont Natural Gas Co Inc	48%	0.76	40.0%	0.59
TC Pipelines LP	27%	0.40	40.0%	0.34
Ports				
Forth Ports PLC	39%	0.95	28.0%	0.74
Hamburger Hafen und Logistik AG	13%	1.20	29.4%	1.10
Water				
Severn Trent PLC	116%	0.40	28.0%	0.22
Pennon Group PLC	81%	0.43	28.0%	0.27
Northumbrian Water Group PLC	156%	0.57	28.0%	0.27
United Utilities Group PLC	129%	0.36	28.0%	0.19
California Water Service Group	60%	0.59	28.0%	0.41
SJW Corp	67%	0.86	28.0%	0.58

Notes and Sources
[D]=[B]/(1+(1-[C])x[A])

Table 11 illustrates the asset beta for each peer group. For the Transmission activity, the beta is calculated as the median asset beta for the transmission peer group. Similarly, for water, the beta is

[27] 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.

calculated as the median asset beta for the water peer group. For the pilotage activity, as discussed in section 2, we give an equal weighting to the asset betas of ports, transmission and water. Hence the asset beta for pilotage is calculated as the simple average of the median asset beta for water, the median asset beta for transmission and the asset beta for Forth Ports. Hence each sector is given a one-third weight in the pilotage activity beta. As discussed in section 2, the reason for using a simple average is that we see no reason to give one sector a higher weighting than any other.

Table 11: Asset Beta by Activity

Firm	Country	Transmission	Pilotage	Water
Energy				
Snam SpA	Italy	0.35	0.35	
Terna Rete Elettrica Nazionale SpA	Italy	0.34	0.34	
REN - Redes Energeticas Nacionais SGPS SA	Portugal	0.15	0.15	
Red Electrica Corp SA	Spain	0.60	0.60	
Enagas SA	Spain	0.61	0.61	
National Grid PLC	UK	0.20	0.20	
Elia System Operator SA/NV	Belgium	0.13	0.13	
Northwest Natural Gas Co	US	0.46		
Piedmont Natural Gas Co Inc	US	0.59		
TC Pipelines LP	US	0.34		
Average		0.35	0.34	
Ports				
Forth Ports PLC	UK		0.74	
Hamburger Hafen und Logistik AG	Germany		1.10	
Average			0.92	
Water				
Severn Trent PLC	UK		0.22	0.22
Pennon Group PLC	UK		0.27	0.27
Northumbrian Water Group PLC	UK		0.27	0.27
United Utilities Group PLC	UK		0.19	0.19
California Water Service Group	US			0.41
SJW Corp	US			0.58
Average			0.24	0.27
(Weighted) Average		0.35	0.50	0.27

6.6. EQUITY BETAS

We re-lever the asset beta derived for each activity in the previous section to the 50% gearing of the regulated asset described in Section 0. Table 12 shows the equity beta for each activity.

Table 12: Equity beta for each activity

		Transmission	Pilotage	Water	Notes
Asset Beta	[1]	0.35	0.50	0.27	See Section 6.5
Gearing (D/A)	[2]	50%	50%	50%	See Section 3
Gearing (D/E)	[3]	100%	100%	100%	[2]/(1-[2])
Tax Rate	[4]	25%	25%	0%	Dutch Corporate Tax Rate
Equity Beta	[5]	0.61	0.88	0.54	[1]x(1+(1-[4])x[3])

6.7. THE EQUITY RISK PREMIUM

The methodology specifies a 'European' ERP. That is, it uses an ERP based on the excess return of stocks over bonds for the major economies of Europe, rather than the ERP based on only the excess return of shares in the Netherlands. More specifically, the NMa has determined to use the simple average of the long-term arithmetic and geometric ERP as the anchor for the ERP estimate. The NMa will then examine other sources of information on the ERP in particular evidence of the ERP from Dividend Growth Models, and use these results as a check on the validity of the historical data for the next regulatory period. In line with the NMa's methodology we present evidence on the long-term ERP in Europe using both the arithmetic and geometric realised ERP.

Table 13 below illustrates the realised ERP derived from DMS data in individual European countries taken from the February 2013 DMS report. This report contains ERP estimates using data up to and including 2012. Table 13 also shows the simple and weighted average ERP for the Eurozone. All the ERPs are calculated relative to long-term bonds and the weighting is based on current market-capitalisation of each country's stock market. Hence, the ERPs of larger markets are given more weight, assuming that a typical investor would have a larger share of their portfolio in countries with more investment opportunities.

Table 13: Historic Equity Risk Premium Relative to Bonds: 1900 - 2012

	Geometric Mean [1]	Arithmetic Mean [2]	Average [3]	Standard Error [4]	Current Market Cap ($mm) [5]
Belgium	2.3%	4.3%	3.3%	2.0%	312,551
Denmark	1.8%	3.3%	2.6%	1.6%	265,105
Finland	5.3%	8.9%	7.1%	2.8%	173,907
France	3.0%	5.3%	4.2%	2.1%	1,723,289
Germany	5.2%	8.6%	6.9%	2.7%	1,599,659
Ireland	2.6%	4.6%	3.6%	1.9%	124,002
Italy	3.4%	6.8%	5.1%	2.8%	502,150
The Netherlands	3.3%	5.6%	4.5%	2.1%	306,803
Norway	2.2%	5.2%	3.7%	2.6%	295,767
Spain	2.1%	4.1%	3.1%	1.9%	583,333
Sweden	2.9%	5.1%	4.0%	2.0%	644,287
Switzerland	2.0%	3.5%	2.8%	1.7%	1,328,124
United Kingdom	3.7%	5.0%	4.4%	1.6%	3,449,459
Europe	3.4%	4.8%	4.1%	1.5%	n/a
World	3.2%	4.4%	3.8%	1.4%	n/a
Average Eurozone	3.4%	6.0%	4.7%		
Value-Weighted Average Eurozone	3.6%	6.4%	5.0%		

Sources and Notes:

[1] - [4]: Credit Suisse Global Investment Returns Sourcebook 2013, Table 9.

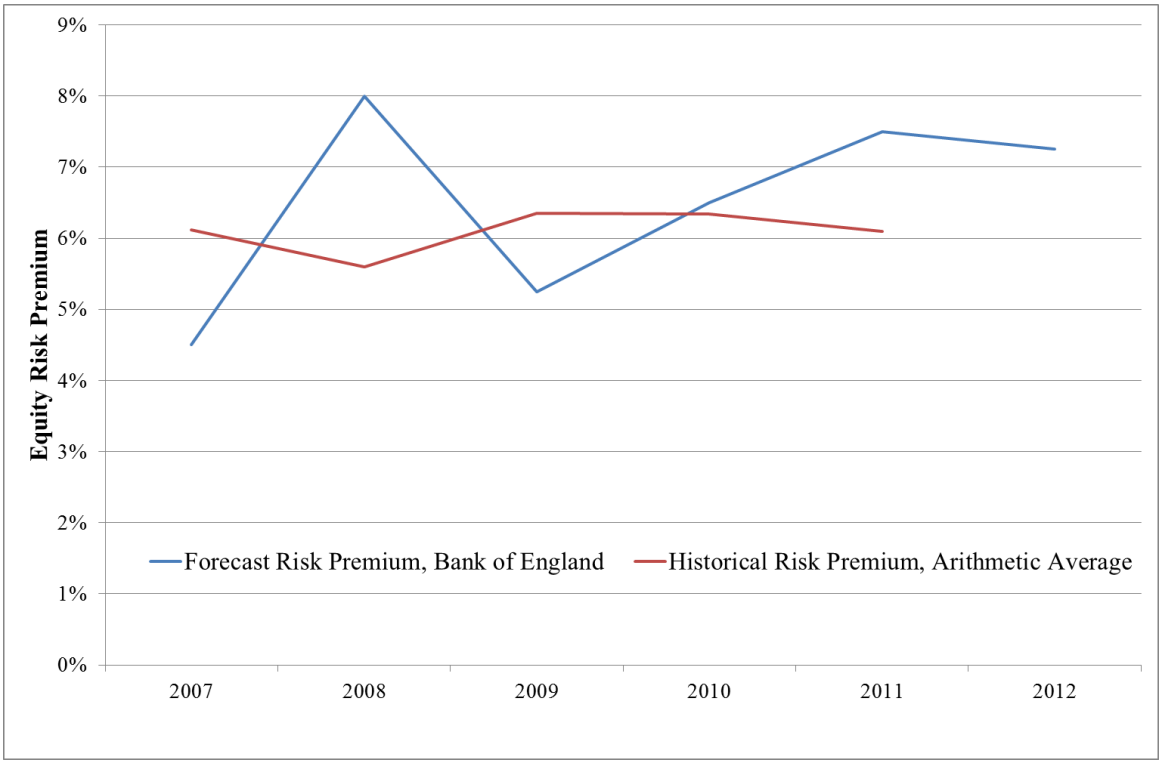
[5]: Bloomberg LP as of 3/1/2013.

Looking at Table 13 the simple average of the arithmetic and geometric ERP for the period 1900 to 2012 was 4.1% if all of Europe is included, and 4.7% if only Eurozone countries are included. The very low ERP in Denmark and Switzerland in particular lower the simple average ERP for all of Europe. Using the market size to weight the averages for all of Europe, the ERP for the Eurozone is 5.0%. These figures reflect the very long run and notably exclude countries in former Eastern Europe. As discussed in section 6.1, we use the ERP for the Eurozone, since 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 Euro zone.

ERPs forecasted on the basis of Dividend Growth Models are currently above the historically realised ERP. For example, the Bank of England produces ERP forecasts based on Dividend Growth Models, and forecasts the Euro Stoxx ERP at a little over 7%.[28] As illustrated in Figure 4, 7% is above the historically realized simple average ERP for the Eurozone, which is 3.4% and 6.0% for the geometric and arithmetic average respectively.

[28] Bank of England, "Financial Stability Report," June 2012, Issue 31, Chart 1.11 p. 10. The next issue of the Bank of England's Financial Stability Report is due in mid-December 2012.

Figure 4: Eurozone Historical and Forecast Risk Premiums by Year



Accordingly, forecast ERP estimates based on Dividend Growth Models are above the long-term average of the arithmetic and geometric ERP for Europe. Therefore, it seems reasonable not to make any of the downward adjustments that are sometimes applied to the historical average ERP, such as adjustments for the increase in price-dividend ratios over the last 50 years, and instead take the 'raw' historical ERP estimates. Accordingly, we apply a Eurozone average ERP of 5.0%.

7. WEIGHTED AVERAGE COST OF CAPITAL

Table 14 illustrates the overall calculation of the WACC for the different activities.

Table 14: WACC for the different activities

		Transmission	Pilotage	Water	Notes
Risk Free Rate	[1]	2.5%	2.5%	2.5%	See Section 4
Asset Beta	[2]	0.35	0.50	0.27	See Section 6.5
Equity Beta	[3]	0.61	0.88	0.54	[2]x(1+(1-[9])x[11])
ERP	[4]	5.0%	5.0%	5.0%	See Section 6.7
After-tax Cost of Equity	[5]	5.6%	6.9%	5.2%	[1]+[3]x[4]
A-Rated Debt Premium	[6]	1.2%	1.2%	1.2%	See Section 5
Non-interest Fees	[7]	0.15%	0.15%	0.15%	See Section 5
Pre-tax Cost of Debt	[8]	3.9%	3.9%	3.9%	[1]+[6]+[7]
Tax Rate	[9]	25%	25%	0%	Dutch Corporate Tax Rate
Gearing (D/A)	[10]	50%	50%	50%	See Section 3
Gearing (D/E)	[11]	100%	100%	100%	[10]/(1-[10])
Nominal After-tax WACC	[12]	4.2%	4.9%	4.5%	(1-[10])x[5]+(1-[9])x[8]x[10]
Inflation	[13]	2.0%	2.0%	2.0%	See Section 8
Nominal Pre-tax WACC	[14]	5.6%	6.5%	4.5%	[12]/(1-[9])
Real Pre-tax WACC	[15]	3.6%	4.4%	2.5%	(1+[14])/(1+[13])-1

7.1 COMPARISON WITH PREVIOUS NMA WACC DECISIONS

In Table 15 we have compared the WACC result in the Brattle report to the NMa's previous WACC based on work by Oxera. While the Brattle WACC is 120 basis points below the previous WACC estimated for GTS in May 2011, we find that all but 10 basis points can be explained by changes in the risk-free rate. The Brattle WACC is 90 basis points below the previous WACC derived for water companies. But if we had applied the risk-free rate applied at the time of the last estimation, the method we are currently applying would result in a WACC 20 basis points higher. Hence most of the change in the nominal WACCs estimated in 2011 can be explained by decreases in interest rates and hence the risk-free rate.

Table 15: Comparisons of the current WACC estimate with previous WACC estimates for NMa

Study by:				Oxera	Oxera
Sector:				GTS	Water
Nominal Risk Free					
	Low	[1]	See note	3.3%	3.3%
	High	[2]	See note	3.8%	3.8%
	Average	[3]	([1]+[2])/2	3.6%	3.6%
After-tax Nominal WACC Mid point					
	Low	[4]	See note	4.6%	4.3%
	High	[5]	See note	6.2%	6.5%
	Average	[6]	([4]+[5])/2	5.4%	5.4%
Brattle adjusted WACC					
	Brattle Nominal Risk Free	[7]	See note	2.5%	2.5%
	Relevant Brattle Nominal after-tax WACC	[8]	See note	4.2%	4.5%
	Difference, Brattle WACC and old WACC	[9]	[8]-[6]	-1.2%	-0.9%
	Difference in old and new risk free rates	[10]	[3]-[7]	1.1%	1.1%
	Brattle WACC using old risk-free rate	[11]	[8]+[10]	5.3%	5.6%
	Difference, adjusted Brattle WACC and Old WACC	[12]	[11]-[6]	-0.1%	0.2%

[1], [2], [4], [5]: Oxera, Cost of capital for GTS: annual estimates from 2006 onwards, May 2011, Table 1.2 p. 5. and Oxera, Estimating the cost of capital of the Dutch water companies, March 2011 Table 1.1 p.3
[7], [8]: Table 14.

8. INFLATION

The WACC we have calculated in the previous section is a nominal after-tax WACC.[29] To convert this to a real WACC requires an adjustment for inflation. The methodology requires that inflation consider both historic and forecast rates of inflation in the Netherlands and Germany.

Historical inflation over the prior three years amounts to 2.06% for Germany and 2.57% for the Netherlands.[30] This period matches the time horizon used for the risk free rate, which may be useful as the bond yields will have inherent assumptions on the inflation expectations of the market.

Euro-area inflation predictions are provided by the ECB, which are based on a survey of professional forecasters. The short term prediction for the upcoming calendar year is 1.9%, and the five-year prediction is 2%.[31]

[29] The method assumes that since the water companies are publicly held and do not pay taxes, a tax rate of zero should be applied.
[30] Data from Eurostat
[31] Data from the ECB

The CPB also provides a short term forecast of inflation rates for the Netherlands: the predicted inflation for 2013 is 2.75%. The Bundesbank provides a forecast for Germany of 1.5% in 2013 and 1.6% in 2014.[32]

Based on the considerations above, we use an inflation rate of 2%. Table 16 illustrates the real after-tax WACCs that result when we apply this inflation rate.

Table 16: Real after-tax WACCs

		Transmission	Pilotage	Water	Notes
Nominal After-tax WACC	[1]	4.2%	4.9%	4.5%	See Section 7
Tax Rate	[2]	25%	25%	0%	Dutch Corporate Tax Rate
Inflation	[3]	2.0%	2.0%	2.0%	
Nominal Pre-tax WACC	[4]	5.6%	6.5%	4.5%	[1]/(1-[2])
Real Pre-tax WACC	[5]	3.6%	4.4%	2.5%	(1+[4])/(1+[3])-1

[32] Bundesbank, Summary of December Monthly Report, *"Outlook for the German economy –macroeconomic projections for 2013 and 2014"*, December 2012.

Appendix I – Statistical Reliability

We detail the standard diagnostic tests to assess if the beta estimates satisfy the standard conditions underlying ordinary least squares regression, which are: that the error terms in the regression follow a normal distribution and that they do not suffer from heteroskedasticity[33] or auto-correlation.[34] Failure to meet these conditions would not invalidate the beta estimates, but would have the following consequences:

1. Although OLS is still an unbiased procedure in the presence of heteroskedasticity and/or autocorrelation, it is no longer the best or least variance estimator.
2. In the presence of heteroskedasticity and/or autocorrelation, the standard error calculated in the normal way may understate the true uncertainty of the beta estimate.
3. Heteroskedasticity and/or auto-correlation may indicate that the underlying regression is mis-specified (i.e. we have left out some explanatory variable).

Heteroskedasticity

We apply White's test for heteroskedasticity. Table 17 illustrates the results.

[33] Heteroskedasticity means that there exists sub-populations in the sample which have different variance from others.

[34] Auto-correlation means that the error terms between periods are correlated.

Table 17: White's test for Heteroskedasticity

	3 yr		
	White Stat	p-value	Heterosk-edascity
Energy			
Snam	1.18	0.55	No
Terna Rete Elettrica Nazionale	1.09	0.58	No
REN - Redes Energeticas Nacionais	1.93	0.38	No
Red Electrica	0.33	0.85	No
Enagas	0.81	0.67	No
National Grid	5.87	0.05	No
Elia System Operator	9.62	0.01	Yes
Kinder Morgan Energy Partners	47.68	0.00	Yes
Northwest Natural Gas	18.12	0.00	Yes
Piedmont Natural Gas	37.68	0.00	Yes
TC Pipelines	32.05	0.00	Yes
Ports			
Forth Ports	5.70	0.06	No
Hamburger Hafen AG	22.66	0.00	No
Water			
Severn Trent	0.12	0.94	No
Pennon Group	5.14	0.08	No
Northumbrian Water Group	12.68	0.00	Yes
United Utilities Group	0.65	0.72	No
California Water Service	22.77	0.00	Yes
SJW Corp	14.94	0.00	Yes

The results indicate the presence of some heteroskedasticity in the sample. This most likely relates to the significant increase in market volatility around the heart of the crisis at the start of the sample period, and a subsequent decrease, changing the variance of the population over the sampling period.

Autocorrelation

We also apply the Durbin-Watson test for auto-correlation. Unsurprisingly, this test indicates a degree of autocorrelation in all of the regressions, also likely reflecting the development of the credit crisis and the changing extent of market volatility. The effect of this auto-correlation is that standard errors will over-estimate the precision of the regression. The results are presented in Table 18:

Table 18: Durbin–Watson Test for Auto-correlation

	3 yr	
	DW Stat	Serial Correlation
Energy		
Snam	1.664	Yes
Terna Rete Elettrica Nazionale	1.602	Yes
REN - Redes Energeticas Nacionais	1.475	Yes
Red Electrica	1.587	Yes
Enagas	1.767	Indecisive
National Grid	1.536	Yes
Elia System Operator	1.745	Yes
Kinder Morgan Energy Partners	1.481	Yes
Northwest Natural Gas	1.390	Yes
Piedmont Natural Gas	1.553	Yes
TC Pipelines	1.479	Yes
Ports		
Forth Ports	1.663	Yes
Hamburger Hafen AG	1.824	No
Water		
Severn Trent	1.581	Yes
Pennon Group	1.503	Yes
Northumbrian Water Group	1.489	Yes
United Utilities Group	1.484	Yes
California Water Service	1.894	No
SJW Corp	1.581	Yes

Prais-Winsten Regressions

To account for the inclusion of auto-correlation in the sample a standard statistical technique is to apply a regression using the Prais–Winsten estimation tests. We also control for heteroskedasticity. The results are presented in Table 19:

Table 19: Prais-Winsten Regressions Results

	OLS Beta		Prais-Winsten Regression	
	Beta	Standard Error	Beta	Standard Error
Energy				
Snam	0.56	0.03	0.56	0.03
Terna Rete Elettrica Nazionale	0.55	0.03	0.55	0.03
REN - Redes Energeticas Nacionais	0.34	0.03	0.34	0.03
Red Electrica	0.83	0.04	0.83	0.07
Enagas	0.82	0.04	0.84	0.06
National Grid	0.34	0.03	0.33	0.04
Elia System Operator	0.24	0.03	0.25	0.03
Northwest Natural Gas	0.74	0.03	0.75	0.03
Piedmont Natural Gas	0.89	0.03	0.89	0.06
TC Pipelines	0.39	0.04	0.39	0.05
Ports				
Forth Ports	0.95	0.05	0.97	0.07
Hamburger Hafen AG	0.95	0.04	0.98	0.05
Water				
Severn Trent	0.39	0.03	0.39	0.03
Pennon Group	0.42	0.03	0.42	0.04
Northumbrian Water Group	0.44	0.03	0.43	0.04
United Utilities Group	0.36	0.03	0.36	0.03
California Water Service	0.78	0.03	0.76	0.05
SJW Corp	1.09	0.04	1.09	0.08

The corrections for auto-correlation and heteroskedasticity do not have a significant impact on the results.

Appendix II – Response to NERA Report

NERA have submitted a report on behalf of Netbeheer Nederland,[35] responding to Brattle's November 2012 report on the cost of capital.[36] In this appendix we respond to the criticisms raised in the NERA report.

NERA claim that the WACC in the Brattle report is too low, based on previous WACC decisions by the NMa and other WACC decisions by other EU energy regulators. But NERA fail to account for the significant fall in both nominal and real risk-free rates which have occurred since 2009. Accounting for the fall in the risk-free rate accounts for most of the differences between the current NMa WACC and the WACC estimates which NERA cites.

NERA allege an inconsistency in the data periods we use – specifically that we are using a short-term estimate of the risk-free rate and a long-term ERP estimate, and that at present this creates a downward bias in the WACC estimate. In essence this argument amounts to a complaint that we have not given ERP estimates based on Dividend Growth Models more weight, and that we have not made an upward adjustment to the ERP. But there is no consensus on whether estimates based on Dividend Growth Models give a better estimate of the ERP. NERA also agreed with this in work for OPTA last year. We have made an upward adjustment to the ERP, by not applying the standard downward adjustments that are normally applied to an ERP estimate based on historical data.

NERA claim our estimate of beta is biased because it is short term. But NERA neglects to mention that using a longer period to estimate beta would bring the peak of the financial crisis into the data sample. This is likely to make any biases of beta much worse. The beta estimation we use avoids the worst of the financial crisis in late 2008 and early 2009, and therefore produces a better forward-looking estimate of beta.

NERA claim that the choice of comparators for estimating betas is flawed, because the range of asset betas estimated is wide and some firms have different regulatory regimes. But the method deliberately chose a broad range of regulatory regimes to reflect the range of regimes in the Netherlands. The NERA study fails to mention that other cost of capital studies produce a similarly wide range of asset betas estimates.

NERA claims that our allowed WACC and cost of debt is inconsistent with the assumed credit rating. We have examined the NERA's financial model on which it based its claims, and found that it includes four errors which depress the financial ratios. Once these errors are corrected, the model meets or exceeds all of the metrics required for an A rating except one, which is very narrowly missed in some years. This metric has only a 5% weighting, and would be more than offset by another more heavily weighted metric which exceeds the requirement for an A rating. NERA's

[35] Response to Brattle's Estimates of the Weighted Average Cost of Capital for Dutch Network Companies; A report for Netbeheer Nederland, Graham Shuttleworth, 11 January 2013. Hereafter referred to as the NERA report.

[36] The WACC for the Dutch TSOs, DSOs, water companies and the Dutch Pilotage Organisation, 28 November 2012, The Brattle Group, Dan Harris, Bente Villadsen and Jack Stirzaker. Hereafter referred to as the Brattle report.

conclusion that the credit rating in the Brattle report is inconsistent with the WACC is based on errors in their model, and is not correct.

NERA claims that our estimated real return on equity is too low compared to the historic return on equity. But NERA incorrectly mix comparisons of arithmetic and geometric averages. On a like-for-like basis, the estimated return is very close to the real cost of equity in the Brattle report. The remaining difference is explained by the fact that forecast real-risk-free rates are much lower than the historic average real-risk free rate. Hence the allowed real return in the Brattle report looks low compared to the historic return because the real risk-free rate is forecast to be low over the regulatory period.

We conclude that once the errors in the NERA models are corrected and the various WACC estimates are put on a like-for-like basis, there is no basis to conclude that the WACC estimate in the Brattle report is unreasonable or too low.

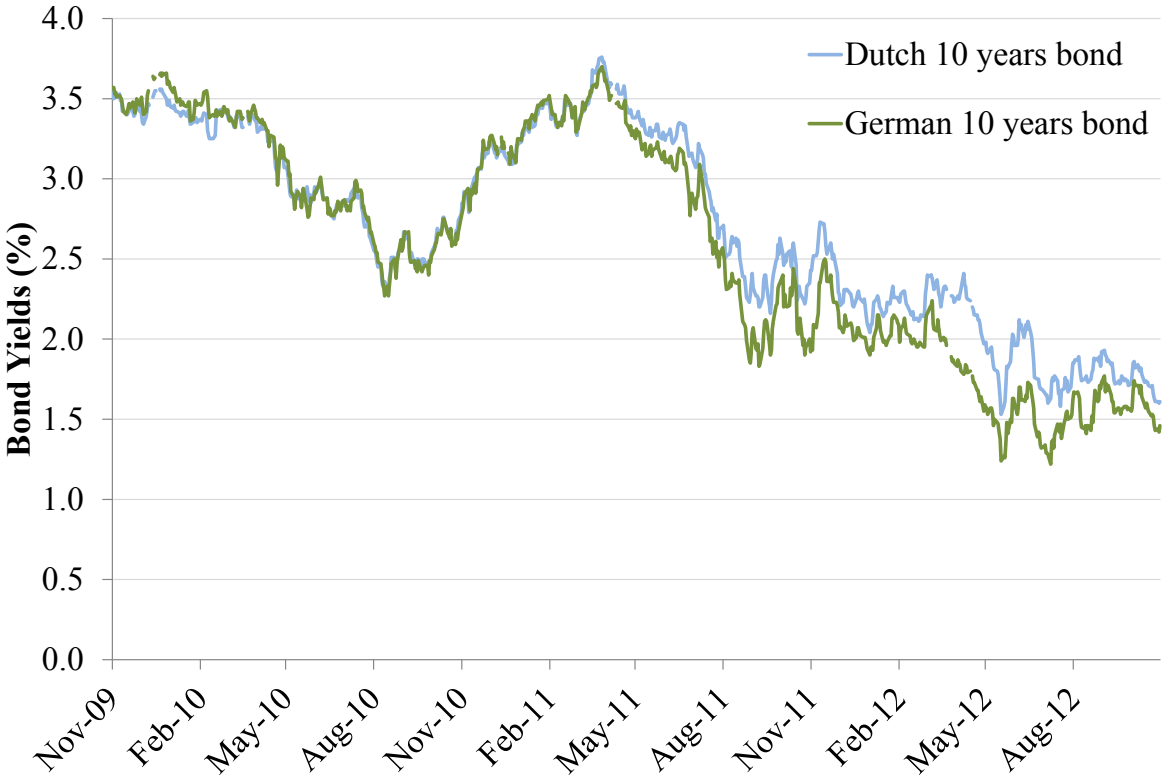
Comparison with the WACC Decisions of other regulators

Section 2.1 of the NERA report claims that the WACC estimate in the Brattle report is below 'regulatory precedent'.

Any comparison of WACCs between regulators must recognize that the WACC parameters change over time. Hence it is only meaningful to compare parameters of the WACC, such as beta, the ERP and the risk-free rate, when they are calculated over the same time period. Comparing a WACC estimated at the end of 2012 to a WACC in an earlier period is not meaningful unless adjustments are made.

In this particular case, the risk-free rate has dropped substantially since 2009 and 2010. As a minimum, any comparison between WACCs at different points in time should control for changes in interest rates. Figure 5 illustrates the yield on Dutch and German 10 year Government bonds, which is the risk-free rate according to the methodology. The average yield on Dutch 10-year bonds was about 3.5% at the end of 2009. At the end of 2012 the yield was 1.6% - a drop of nearly two percentage points. The latest WACC decisions NERA presents are from 2011. We find that the average yield in 2011 was 2.98%. Figure 5 shows that most of the fall in interest rates occurred from mid-2011 onwards, and hence would not have been incorporated in the WACC decisions which NERA presents as comparable.

Figure 5: Yield on Dutch and German Government 10 Year Bonds



For example, shifting the dotted line (which represents the NMa WACC) in Figure 2.1 of the NERA report upwards by two percentage points seems to put the NMa's WACC close to the middle of the sample.

In Table 20 we have also compared the WACC result in the Brattle report to the NMa's previous WACC based on work by Oxera. While the Brattle WACC is 110 basis points below the previous WACC estimated for GTS in May 2011, we find that all but 15 basis points can be explained by changes in the risk-free rate. The Brattle WACC is 142 basis points below the WACC derived for water companies, but 95 basis points are accounted for by the change in the risk-free rate. Contrary to NERA's claim, the WACC we estimate is not low because we have made errors in the calculations or chosen unreasonable parameters. The WACC is relatively low because interest rates are at historically low levels.

Table 20: Comparison between Brattle WACC and previous WACC estimates for NMa

Study by:				Oxera	Oxera
Sector:				GTS	Water
Nominal Risk Free					
	Low	[1]	See note	3.30%	3.30%
	High	[2]	See note	3.80%	3.80%
	Average	[3]	{[1]+[2]/2}	3.55%	3.55%
After-tax Nominal WACC Mid point					
	Low	[4]	See note	4.58%	4.33%
	High	[5]	See note	6.23%	6.51%
	Average	[6]	{[4]+[5]/2}	5.40%	5.42%
Brattle adjusted WACC					
	Brattle Nominal Risk Free	[7]	See note	2.60%	2.60%
	Relevant Brattle Nominal after-tax WACC	[8]	See note	4.30%	4.00%
	Difference, Brattle WACC and old WACC	[9]	[8]-[6]	-1.10%	-1.42%
	Difference in old and new risk free rates	[10]	[3]-[7]	0.95%	0.95%
	Brattle WACC using old risk-free rate	[11]	[8]+[10]	5.25%	4.95%
	Difference, adjusted Brattle WACC and Old WACC	[12]	[11]-[6]	-0.15%	-0.47%

[1], [2], [4], [5]: Oxera, Cost of capital for GTS: annual estimates from 2006 onwards, May 2011, Table 1.2 p. 5. and Oxera, Estimating the cost of capital of the Dutch water companies, March 2011 Table 1.1 p.3
[7], [8]: The WACC for the Dutch TSOs, DSOs, water companies and the Dutch Pilotage Organisation, 28 November 2012, The Brattle Group, Table 1 p.2.

NERA also fails to account for differences in country risk in Figures 2.1, 2.2 and 2.3, and in their comparison of the real post-tax cost of equity in Figure 2.4. Generally regulators use the bond yields of their own country when setting the WACC. But yields in individual Member States have varied dramatically since the emergence of the sovereign debt crisis in late 2009. Yields on Spanish, Italian and Portuguese bonds have been several times higher than yields on German and Dutch bonds over this period. The NERA analysis does not account for these differences.

Allegations of a downward bias

In section 2.2 and section 3.1 of their report, NERA alleged that Brattle have used inconsistent parameters which cause a downward bias in the WACC estimate. NERA's point is in essence that:

a. We have combined a long-run (roughly 100-year) estimate of the ERP and a 'short-run' (3-year) estimate of the risk-free rate.

b. There is a negative correlation between the actual ERP and the risk-free rate, and the risk-free rate is currently relatively low while the ERP is high;

c. Therefore combining a low-risk-free rate with the 'average' ERP results in a cost of equity which is too low.

This criticism assumes that the ERP as estimated by Dividend Growth Models, and as published by the Bank of England (among others), is the correct estimate of the ERP. When NERA accuses the Brattle report of 'bias', what they are really saying is that we should give more weight to ERP estimates based on forecasts produced by Dividend Growth Models, not the long-term DMS data. But there is no consensus among financial economists regarding how much weight should be given to ERP estimates based on Dividend Growth Models. In a report on the cost of capital for OPTA published in July 2012, NERA discussed the relative merits of estimating the ERP using historical data of the type produced by DMS and Dividend Growth Models, and concluded that "[t]here is no consensus on which approach is superior."[37] In that report, NERA proposed using a simple average of the ERP resulting from the two approaches.

We discussed the various ways of estimating the ERP at some length in a previous report for the NMa.[38] We concluded that the best methodology was to base the ERP estimate on the long-term history of stock returns relative to bonds, with some adjustments, and specifically the data provided by Dimson, Marsh and Staunton (DMS). The DMS data set is the most common source of ERP estimates for European regulators. We considered using ERP estimates from Dividend Growth Models. We concluded that these estimates were a useful guide that should be used to judge if any adjustments were required to the ERP estimate based on DMS data, but were too volatile to be the only source of ERP estimate, as they essentially depend on analysts' forecasts.

NERA also acknowledged that most regulators use estimates based on DMS data. DMS also note that while the ERP does change over time, periods of volatility tend to be short-lived.[39] For forecasting the ERP over a four year price control period, most regulators agree that ERP estimates based on long-run DMS data is the best option.

In essence the criticisms of 'bias' is the same point that NERA make in section 3.2 of their report – that, according to NERA, we recommend an upward adjustment to the ERP , but then do not apply one.

NERA is not correct that we do not make an upward adjustment to the ERP estimate. In section our report we said that:

> d. "forecast ERP estimates based on Dividend Growth Models are above the long-term average of the arithmetic and geometric ERP for Europe. Therefore, it seems reasonable not to make any of the downward adjustments that are sometimes applied to the historical average ERP, such as adjustments for the increase in price-dividend ratios over the last 50 years, and instead take the 'raw' historical ERP estimates."[40]

[37] NERA, The Cost of Capital for KPN's Wholesale Activities, A Final Report for OPTA, 9 July 2012, p.17.
[38] 'Calculating the Equity Risk Premium and the Risk-free Rate', The Brattle Group, 26 November 2012, Dan Harris, Bente Villadsen, Francesco Lo Passo.
[39] E. Dimson, P. Marsh, and M. Staunton, *Credit Suisse Global Investment Returns Sourcebook 2012* (DMS), Section 2.7.
[40] The Brattle report, section 6.7 p.22.

We did apply an upward adjustment to the ERP based on DMS data, by not applying the downward adjustment that are normally applied to convert the historical data into a forward looking ERP estimate. These adjustments were discussed in detail in our first report for the NMa.[41] To obtain their ERP forecast, DMS apply a downward adjustment to the 'raw' historical outturn ERP of between 80 and 130 basis points. By not applying this downward adjustment, we have in effect increased the standard DMS-based ERP estimate by between 80 and 130 basis points, to account for the evidence from the Dividend Growth Models.

Bias in the Beta estimates

NERA claim that by using a three year beta, the NMa's method biases the estimate of beta downwards. According to NERA, this is because during the financial crisis regulated firms perform relatively well as the market falls. This reduces the correlation between the regulated firms' share price and the market index, and so their beta is lower during such periods. If there is unlikely to be another financial crisis in the next regulatory period, then a forecast of beta based on historic data which includes a crisis could be too low.

We agree with this effect in theory, but note that it only applies during periods of very high market volatility, such as the period following the bankruptcy of Lehman brothers (Q4 2008 and Q1 2009). Our three year beta estimate use data form the period 2010 to 2012 inclusive – thereby missing the main period of market volatility that could create a downward bias in the beta estimate.

NERA do not say what period they would prefer to measure the beta over, but given that they criticize three-years as being 'too short' presumably they think a longer period would be better. But using a longer five year beta estimate would include the period 2008-2009 when the financial crisis was at its height. The NERA report does not calculate any five-year betas, and so we do not know if the five-year beta NERA seems to prefer would be higher or lower than the betas we estimated. However, on a qualitative basis it seems likely that five-year betas estimated using a period which includes the crisis of 2008/09 would produce lower betas than the three-year betas we calculated.

Choice of Comparators

In section 3.4 of their report NERA criticize the Brattle choice of comparators for estimating betas. NERA criticize the inclusion of Elia in the sample of comparators, and note that it was included from a cost of capital report by Frontier Economics on the basis of its regulatory regime. However, the features of the regulatory regime which NERA cite as grounds for exclusion from the NMa's sample apply to many other regulated firms, which also have ex-post revenue adjustments and secured revenues. More generally, the NMa's methodology deliberately included a wide range of regulatory regimes, precisely because the objective was to reflect the different regulatory regimes present in the Netherlands – specifically price-cap and revenue cap regimes.

NERA cite the range of asset beta estimates in the Brattle report – from 0.12 to 0.6 for asset betas – as evidence of a flawed sample. However, NERA fails to mention that such a wide range of beta estimates is normal in this kind of exercise. In the Frontier report that NERA cite as evidence for

[41] 'Calculating the Equity Risk Premium and the Risk-free Rate', section 4.3.

excluding Elia, the range of adjusted three-year betas is 0.13 to 0.5.[42] In their WACC estimates for GTS, Oxera estimated asset betas for 2011 with a range of 0.19 to 0.6 based on weekly data.[43]

While illiquid share trading can create low betas, we checked that Elia met standard liquidity tests and so could be included in the sample.

NERA's proposed adjustments

NERA seem to think that a one year risk-free rate estimate, that is, an average of the risk-free rates over the last year, is consistent with a one-year ERP estimate derived from a Dividend Growth Model. However, NERA forget that the risk-free rate is based on 10 year Government bonds. Hence even a yield taken on a single day is a forecast of interest rates over the next 10 years. In contrast the ERP is a forecast for one year only. Hence using a one-year forward looking estimate and a one-year average of 10-year bond yields is not consistent.

In its July 2012 report for OPTA, NERA did not recommend using only the ERP estimate for one year – but rather recommended using an average of the ERP based on long-term forecast from DMS data and Dividend Growth Models, and combining this with a risk-free rate averaged over the last three years.

The objective of the NMa WACC estimation exercise is to forecast a WACC for the next regulatory period – a period of about four years. Hence using the 1 year ERP forecast would be incorrect. As discussed above, we have argued that an ERP based on a DMS data is the best estimate for the forward looking ERP over this period.

More generally NERA suggest that to use a forecast of the ERP based on long-term average of historic data (from DMS), we should also use a risk-free rate based on some long-term average of historic data – NERA suggests 10 years. But this proposal confuses two different concepts. Financial economists think that past returns – suitably adjusted – provide a good guide to the ERP that investors expect in the future. This is the basis of using the DMS series to estimate the ERP. But few financial economists believe that bond yields from 10-years ago will give us any useful information about what interest rates will be in the future. For that, we should use that using more recent bond-yield data. NERA's proposal that we should use long-term averages of interest rates to be consistent with a long-term ERP estimate is flawed. Again the main point NERA seems to be making is that the ERP estimate should be adjusted upward – we agree and have made such an adjustment.

Financial Ratios

In section 4.1 of the report, NERA claims that our allowed WACC and cost of debt is inconsistent with the assumed credit rating. Specifically, NERA claim that the cash flows that would result would fail to meet several metrics for an 'A' rated company.

[42] Frontier Economics (2011), Wissenschaftliches Gutachten zur Ermittlung des Zuschlages zur Abdeckung netzbetriebsspezifischer unternehmerischer Wagnisse im Bereich Gas, Gutachten im Auftrag der Bundesnetzagentur (A report for BNetzA), September 2011, Table 9 p.47.

[43] Oxera, Cost of capital for GTS: annual estimates from 2006 onwards, May 2011, table A1.6 p.42.

We have examined the NERA's financial model on which it based its claims, and found that it includes four errors which depress the financial ratios:

e. The model applies a real cost of capital, and therefore needs to inflate the RAB every year to ensure the correct returns. However, the model then assumes that debt also increases as a result of inflating the RAB. This is not correct. The inflation of the RAB is simple an exercise in the regulatory accounts – no extra borrowing is required to cover this inflation. This error increases the assumed level of debt and hence interest costs.

f. The model applies the pre-tax cost of debt, but then neglects that interest costs can be offset against tax. Hence the model should apply the lower post-tax cost of debt.

g. The model neglects to depreciate the new investments assumed, and hence underestimates the allowed revenues.

h. The model applies a financial ratio incorrectly. The Moody's Rating Methodology[44] cited by NERA calculates a ratio where the Remaining Cash Flows (RCF), being Funds From Operations (FFO) less dividends, are divided by the New Capex of the year. NERA incorrectly divides by net debt. Since net debt is a much larger number than the new capex, dividing by net debt produces a much lower ratio than dividing by new capex.

Once these errors are corrected, the model satisfies all of the metrics by some margin except the ratio of Funds from operations less dividends to New Capex. The Moody's target for this ratio for an A rated borrower is 1.5x-2.5x. In the model the new ratio calculated varies from 1.3x-1.4x – so the metric is slightly below the lower value of the range for an A rating based on this metric alone.

Moody's determines ratings by considering different Key Rating Factors, each of which has a predefined weight. The Credit Metrics account for a 40% of the Key Rating Factors. The RCF/New Capex ratio accounts only for a 5% in the final rating. However, we also note that the FFO interest cover ratio in the model, which has a 15% weighting, actually meets the standard for an AA rated firm – one rating better than A. Hence a metric with a 15% weighting which qualifies for an AA rating would more than offset a metric with a 5% weighting which only meets a BAA rating standard.

Hence we conclude that the hypothetical firm would qualify for an A rating, once the errors in NERA's model are corrected. NERA's claim that the WACC we estimate is "demonstrably infeasible"[45] is based on errors in their model. The annex to this memo shows our re-creation of the NERA model, and the effect of correcting the errors.

Comparison with Total Market Returns

In section 4.2 of their report NERA claim that the real cost of equity in our report is lower than the real return on equity in Europe. However, NERA are not making a like-for-like comparison,

[44] Source: Moody's Global Infrastructure Finance, "Regulated Electric and gas Networks", August 2009.
[45] NERA report p.14.

because they are comparing the arithmetic average real return with an average of the geometric and arithmetic averages.

Following the NMa's method, the ERP in the Brattle report is calculated as the average of the geometric and arithmetic excess returns of stocks over bonds. The geometric average return is always lower than the arithmetic average. So of course the arithmetic real return will be higher than the return based on an average of the arithmetic and geometric averages. If we re-calculate the real cost of equity using just the arithmetic average ERP of 5.9%, then the real return is 6.49%. This is a number which is comparable with the return NERA cite (6.7%), because both numbers are based on the arithmetic average. Alternatively, if we take the average of the arithmetic and geometric real returns from the DMS data we get a return of 5.65%, again close to the return in the Brattle report of 5.19%.

Perhaps NERA's actual objection is that the method should use the arithmetic average of the historic excess returns, rather than the average of the arithmetic and geometric average excess returns. But if this is the case NERA should simply state this opinion, rather than compare two numbers which are not comparable.

When considering the reasonableness of the allowed real return on equity, we must look at the expected real risk-free rate. If the forecast real risk-free rate is lower, then the real returns that investors demand will be lower. This is because the opportunity cost of their investment is relatively low. It is for this reason that financial economists usually focus on a discussion of the equity risk premium (ERP) – that is, the premium demanded over a risk-free investment – rather than the absolute level of returns.

Accordingly, while the allowed real return in the Brattle report is still lower than the historic comparable real return of 5.65%, this can be simply explained by the fact that forward looking estimates of real interest rates are lower than their historical average level. NERA documented this fact in its July 2012 work for OPTA, noting that "the values for the real risk-free rate that we obtain for 2011 and 2012-2014 are significantly lower than any recent regulatory precedent"[46] and that "real yields on Dutch and German government bond yields are forecast to stay negative throughout the majority of the 2012 to 2014".[47] Figure 3.2 in NERA's report for OPTA illustrates the declines in the real-risk-free rate since 2008. Table 3.3 in the same report shows that NERA's estimate of the real risk-free rate fell from about 2% for the period up to December 2009 to -0.27% for the period 2012-2014. Similarly, the DMS table where NERA cite the estimate of real historical returns of 6.7% also shows that the historic real return on bonds was 2%. In contrast our forecast real risk free rate is only 0.59%. Hence the allowed real return in the Brattle report looks low compared to the historic return because the real risk-free rate is forecast to be low over the regulatory period.

If we applied the average real historic risk-free rate of about 2% to the arithmetic average return of 5.9%, we get a total return of about 7.9% – actually higher than the outturn return of 6.7% which

[46] NERA, The Cost of Capital for KPN's Wholesale Activities, A Final Report for OPTA, 9 July 2012, p.12.
[47] *Ibid*. p.13.

NERA cite. We conclude that the real return on equity in the Brattle report is lower than the historic outturn number NERA cite because:

i. The numbers are not comparable, mixing arithmetic and geometric averages;

j. The forward-looking real risk-free rate is lower than the historic real risk-free rate.

Appendix III – NERA's Financial Model

Table 4 below shows the input data used for modify the model results reported by NERA in Appendix A. Data used are expressed in nominal terms and after tax.

Table 21 – Input data

Input			
RPI	[1]	See note	0%
Average Life	[2]	See note	40
Remaining useful life	[3]	See note	20
Deb/Equity	[4]	See note	50%
Nominal After Tax WACC	[5]	See note	4,30%
Interest of Debt (pre-Tax)	[6]	See note	4%
Nominal Cost of equity	[7]	See note	5,7%
Tax rate	[8]	See note	25,0%

Notes and sources:

[1], [2],[3]: *Nera response to The Brattle's Estimates of the Weighted Cost of Capital for Dutch Network Companies* . Appendix A.

[4], [5],[6], [7], [8]: *The WACC for the Dutch TSOs, DSOs, Water Companies and the Ducth Pilotage Organization,* The Brattle Group 28 November 2012, Table 1.

Tables 5 and 6 show the results of NERA's model adjusted in order to remove the four errors we find.

Table 22: Corrected Balance Sheet and Cash Flow

			t	t+1	t+2	t+3	t+4	t+5
Years			1	2	3	4	5	6
Opening Rab	[1]	See note	1000	999	996	993	988	981
Gross New Capex	[2]	See note	50	50	50	50	50	50
Cost Depreciation (Existing RAB)	[3]	See note	-50	-50	-50	-50	-50	-50
Cost Depreciation (New Capex)	[4]	See note	1,25	2,5	3,75	5	6,25	7,5
Net New Capex	[5]	[5]=[2]+[3]-[4]	-1	-3	-4	-5	-6	-8
Closing RAB	[6]	[6]=[1]+[5]	999	996	993	988	981	974
Average Opening Rab	[7]	See note	998	994	990	984	978	974
Average Liabilities	[8]							
Debt	[9]	See note	499	497	495	492	489	487
Equity	[10]	[10]=[7]-[9]	499	497	495	492	489	487
Cash Flow	[11]							
Return on capital (Nominal after tax)	[12]	See note	43	43	43	42	42	42
Cost Depreciation (Existing RAB+New Capex)	[13]	[13]=[4]-[3]	51	53	54	55	56	58
Interest-post tax (on Debt Portion of RAB)	[14]	See note	15	15	15	15	15	15
Return on capital (after debt)	[15]	[15]=[14]-[12]	28	28	28	28	27	27
Dividends (at nominal cost of equity)	[16]	See note	28	28	28	28	28	28
Return on capital (after debt and dividends)	[17]	[17]=[15]-[16]	0	0	0	0	0	0

Notes and sources:

[1]: Nera Report, Appendix A, Table A.1

[2]: Capex year t inflated yearly by the RPI assumed 0%

[3]: Opening Rab year t divided by the remaining useful life assumed 20 years, then inflated for the RPI set to 0%

[4]: Gross New Capex year t divided by the useful life assumed 40 years, then inflated for the RPI set to 0%

[7]: Average between Closing Rab of year t and t+1

[9]: Average Opening Rab of the year multiplied by the Debt/Equity ratio (set to 50%)

[12]: Average Opening Rab multiplied by the Nominal After-tax WACC (set to 4,30%)

[14]: Debt of the year multiplied by the Debt interest rate (set to 4.0%), net of the tax rate (set to 25%)

[16]: Equity of the year multiplied by the Nominal Cost of equity (set to 5.7%)

Table 23: Corrected Financial ratios resulting from Return on Debt and Equity in Brattle Report compared to the requirements for an A rating

			t	t+1	t+2	t+3	t+4	t+5	Moody's Ratios	
Years			1	2	3	4	5	6	**Min**	**Max**
FFO Interest Cover	[1]		6,3	6,4	6,5	6,6	6,7	6,8	3,5	5
(Return on capital in Revenues+CD)/Interest	[2]	See note								
Adjusted FFO	[3]		2,9	2,9	2,9	2,9	2,9	2,9	2	4
(Return on capital in Revenues)/Interest	[4]	See note								
FFO/Net Debt	[5]		16%	16%	16%	17%	17%	17%	12%	20%
(Return on capital in Revenues+CD-Interest)/Net Debt	[6]	See note								
Net Debt/RAB	[7]		50%	50%	50%	50%	50%	50%	45%	60%
Net Debt/Average Opening Rab	[8]	See note								
RCF/Debt	[9]		1,3	1,3	1,4	1,4	1,4	1,4	1,5	2,5
(FFO-Dividends)/Capex	[10]	See note								

Notes and sources:

[2], [4], [6], [8], [10], See table 5