Calculating the WACC for energy and water companies in the Caribbean Netherlands

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1 Summary

Since July 1, 2016, ACM has been charged with the task to regulate the energy and drinking water companies on the Caribbean islands of Bonaire, St. Eustatius and Saba (the Caribbean Netherlands). ACM is expected to set tariffs for these companies from January 1, 2017. One of the elements of tariff regulation is calculating the reasonable return that companies are allowed to earn on their invested capital. ACM analyzes this reasonable return using the Weighted Average Cost of Capital (WACC).

In this report, ACM calculates the WACC for the regulated electricity and drinking-water companies in the Caribbean Netherlands. The purpose of and principles behind the WACC are explained in chapter 2. The method of the analyzing and calculating the WACC is set out in chapter 3.

The regulated companies in the Caribbean Netherlands differ from each other in terms of activities. Each of the companies carries out different activities. An overview of the companies and their activities are given in table 1.

Table 1: Overview of regulated companies

Company	Island	Electricity production	Electricity distribution	Water production	Water distribution
WEB	Bonaire	V	V	V	V
CG	Bonaire	V	X	X	X
STUCO	St. Eustasius	V	V	V	V
SEC	Saba	V	V	X	X

As the risk level of each of these activities differs, so does the reasonable return for each company. This is reflected in the WACC. Therefore, three different WACCs are calculated. An overview is given in table 2, indicating which WACC is suitable for each company. Companies that carry out all activities are assigned a combined WACC. A combined WACC includes both the water activities and the electricity activities.

Table 2: Overview of suitable WACC per company

Company	Island	WACC
WEB	Bonaire	Electricity & water combined
CG	Bonaire	Electricity, production only
STUCO	St. Eustasius	Electricity & water combined
SEC	Saba	Electricity, production and distribution

In the subsequent chapters, ACM sets out the methodology for calculating the WACC, lists all the relevant data, and uses that data to calculate the relevant parameters. All parameters combined are used to calculate the WACC. A summary of all the different WACCs is given in table 3.

Table 3: Summary of WACC calculations

Parameter	#	Electricity, production & distribution	Electricity, production only	Electricity & water combined	Explanation
Tax	[1]	5.00%	5.00%	5.00%	Chapter 5.2
Gearing (D/A)	[2]	42.00%	42.00%	42.00%	Chapter 5.1
Gearing (D/E)	[3]	72.41%	72.41%	72.41%	= [2]/(1-[2])
Asset bèta	[4]	0.40	0.48	0.40	Chapter 6.2
Equity bèta	[5]	0.68	0.8	0.68	= [4]*(1+(1-[1])*[3])
Risk free rate (equity)	[6]	2.77%	2.77%	2.77%	Chapter 6.1
Equity risk premium	[7]	5.11%	5.11%	5.11%	Chapter 6.3
Cost of Equity	[8]	6.24%	6.86%	6.24%	= [6]+[5]x[7]
Risk free rate (debt)	[9]	3.09%	3.09%	3.09%	Chapter 7.1
Debt premium	[10]	1.21%	1.21%	1.21%	Chapter 7.1
Non-interest fees	[11]	0.15%	0.15%	0.15%	Chapter 7
Cost of Debt (pretax)	[12]	4.84%	4.84%	4.84%	= [9]+[10]+[11]
Nominal WACC (after tax)	[13]	5.40%	5.75%	5.40%	= (1-[2])x[8]+[2]x(1-[1])x[12]
Nominal WACC (pretax)	[14]	5.68%	6.06%	5.68%	= [13]/(1-[1])

2 Purpose of using the WACC

Networks tariffs are meant to compensate network operators for the costs they incur. Two types of costs can be distinguished: capital costs and operational costs.[1] Capital costs consist of two components: a) the depreciation of assets, which is related to the aging of the assets, and b) the so-called opportunity costs of the investments in these assets. The opportunity costs consist of the benefits that investors could have received if they had invested in an alternative (the second-best) portfolio of assets. After all, by investing in a specific asset, such as an asset of an energy-distribution company in the Caribbean Netherlands, the investor will not receive the benefits of investing that same amount of capital in another sector in another region. The return on the best alternative option is generally based on the return in markets for similar activities as the (regulated) company in question. This return is the so-called weighted average cost of

[1] The former are called CAPEX, which is short for Capital Expenditures, and the latter OPEX, which is short for Operational Expenditures.

capital (WACC), which is the calculated return that investors might be able to achieve by investing both debt and equity capital in similar projects in the market.

One consequence of the idea of opportunity costs is that we use the perspective of investors as the starting point when calculating the WACC. Hence, the cost of capital of a specific investment in a specific industry is determined by what a group of relevant investors could earn in the market. By investing in this industry, these potential earnings in the market are what they sacrifice. In order to determine the opportunity costs of investing in the industries in the Caribbean Netherlands, we need to define the group of potential investors as well as the capital markets in which they are active. The group of potential investors is not restricted to those investors that have already invested in the Caribbean Netherlands, but it includes all investors that could have a potential interest in the firms on these islands. On the basis of theory as well as empirical evidence, we conclude that investors want to increase the geographic diversification of the investment portfolio in order to reduce the risk of their investments. The risks that can be reduced through diversification are called '*non*-systematic risks'. The performance of an investment portfolio increases when it becomes more diversified over both countries *and* industries because this diversification reduces or even removes the non-systematic risks.

The remaining risks are the so-called *systematic* risks, which are the risks that *cannot* be removed by diversification. Because of the presence of systematic risks, investors want to see a compensation for their investments. This compensation is called the required rate of return. The level of the required return on investments can be determined as the equity-risk premium, which is equal to the surplus return on a diversified portfolio of investments (i.e. the market index) above the risk-free interest rate. In order to determine the required return on investments in a specific project, one needs to determine how the risk and return of that project are related to the overall risk in the market. This relationship is called the bèta. This bèta can be determined by looking at the performance of the stocks of a group of industries that are active in similar business within a similar economic and regulatory environment. This group of firms is called the peer group.

In order to determine the reference capital markets and the peer group, it is justified to assume that internationally active investors are interested to invest in companies in the Caribbean Netherlands if these investments improve the performance of their investment portfolios. Moreover, we assume that investors want to have investments in the same region as the Caribbean Netherlands because of the same objective to diversify their portfolio geographically. This region consists of Latin America and North America (in particular the USA). The Caribbean Netherlands are part of the country of the Netherlands. Therefore we also make the assumption that investors from Europe are possibly interested in investing in the Caribbean Netherlands. Hence, the European market is also a reference market to determine the opportunity costs. In conclusion, we define the capital markets in Latin America, USA and Europe together as the reference markets for determining the WACC of investments in the Caribbean Netherlands.

Since there is no reason to assume that these three regions should be weighted differently, we take the average values of the WACC parameters, such as the asset bèta and the risk-free interest rate, in these markets as the best estimate of the opportunity costs of investing in the Caribbean Netherlands.

3 Method

As stated in the previous chapter, the WACC gives the return that investors would achieve by investing both debt and equity capital in similar projects in the market. Therefore, the WACC weights both capital parts by the following formula:

$$WACC = \left(1 - \frac{D}{A}\right) * R_e + \frac{D}{A} * (1 - T_c) * R_d$$

Definitions:
D/A = Gearing (Debt over Assets), percentage financed by debt (chapter 5.1)
Re = Return on equity (Chapter 6)
Rd = Return on debt (Chapter 7)
Tc = Percentage Tax (Chapter 5.2)

To calculate these different parts of the WACC, ACM uses the general ACM method as a starting point. This is a method that is used by different ACM departments for various fields, for example in energy and water regulation. This method is also applied to the situation in the Caribbean Netherlands as explained in the previous chapter. At the start of each chapter, an explanation about the applied method for the specific parameters is given.

In the previous chapter is explained that one needs a peer group to calculate several parts of the WACC. This peer group consists of listed companies with the same activities. Since the regulated companies in the Caribbean Netherlands have different types of activities, three different peer groups are needed. ACM asked Boer and Croon Corporate Finance (BCCF) to compose these peer groups. The report is published with this report. A summary of this report is given in chapter 4.

Most data used to calculate this WACC is downloaded from Bloomberg. For some parameters, other sources are also used, which will be mentioned in the report. Data through 30 June 2016 is used. All the calculations are made in Excel and Stata. Parts of the calculations are presented in the tables in this report and in the appendices.

Both the nominal and the real WACC are calculated in this report. Which WACC is used in tariff regulation depends on other choices in the tariff regulation system. Therefore, both WACCs are estimated. The difference between these two is inflation. How the inflation is estimated is explained in chapter 8.1.

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4 Peer group

As set out in the previous chapters, ACM uses peer groups to calculate the WACC. ACM asked Boer & Croon Corporate Finance (BCCF) to determine these representative and up-to-date peer groups. The study that BCCF did to determine this peer group is published with this report.

BCCF advised ACM to use three different peer groups, since the regulated companies are involved in different activities. These activities are summarized in table 4.

Table 4. Activities of regulated entities

Company	Island	Electricity production	Electricity distribution	Water production	Water distribution	Peer group
WEB	Bonaire	V	V	V	V	Electricity & water combined
CG	Bonaire	V	X	X	X	Energy, production only
STUCO	St. Eustasius	V	V	V	V	Electricity & water combined
SEC	Saba	V	V	X	X	Energy, production and distribution

The result of the study that BCCF did to construct the peer groups for each combination of activities is presented in tables 5, 6 and 7.

Table 5. Peer group for electricity, production and distribution

Company	Country
American Electric Power Company, Inc.	US
Centralschweizerische Kraftwerke AG	Switzerland
Edison International	US
EDP - Energias do Brasil S.A.	Brazil
Eneva S.A.	Brazil
Pampa Energia SA	Argentina
PNM Resources, Inc.	US
Public Power Corporation S.A.	Greece
VERBUND AG	Austria
American Electric Power Company, Inc.	US

Table 6. Peer group for electricity, production only

Company	Country
Albioma	France
Atlantic Power Corporation	US
CPFL Energias Renovaveis SA	Brazil

Endesa Americas SA	Chile
Falck Renewables S.p.A.	Italy
NRG Yield, Inc. Class A	US
Talen Energy Corp	US
Tractebel Energia S.A.	Brazil
Zespol Elektrowni Patnow Adamow Konin SA	Poland

Table 7. Peer group for combined companies

Company	Country
Acea S.p.A.	Italy
Aguas Andinas S.A.	Chile
American Electric Power Company, Inc.	US
American States Water Company	US
Aqua America, Inc.	US
California Water Service Group	US
Centralschweizerische Kraftwerke AG	Switzerland
Cia de Saneamento do Parana SA	Brazil
Companhia de Saneamento de Minas Gerais	Brazil
Edison International	US
EDP - Energias do Brasil S.A.	Brazil
Eneva S.A.	Brazil
Pampa Energia SA	Argentina
PNM Resources, Inc.	US
Public Power Corporation S.A.	Greece
Severn Trent PLC	UK
United Utilities Group PLC	UK
VERBUND AG	Austria

5 Generic parameters

5.1 Gearing

The ACM method prescribes that the gearing will be determined based on peers with healthy financial positions. The same peers as mentioned before will be used for this purpose (chapter 4). To determine which peers have a healthy position[2], ACM will look at the credit rating based on Standard & Poors or Moody's. The credit rating represents the solvency of a firm.

[2] The ACM method prescribes that 'companies with healthy positions' are companies with a credit rating A or higher. Since there are only two peers who meet this criterion, ACM chooses to deviate from the method, and include all peers who are investment-grade.

To determine the gearing (debt over assets), the average over the available data from the period July 2013 – June 2016 is used. The following definitions are used for this determination[3]:

Debt = net debt + total capital leases
Equity = Market capitalization

Dividing the debt by the equity will result in the debt over equity ratio (D/E). To determine the gearing (Debt over Asset ratio (D/A)), the following formula is used:

$$D/A = \frac{D}{D+E} = \frac{D/E}{(1+D/E)}$$

Appendix A shows the gearing of all peers included. The peers' credit ratings, too, are included in this table. A credit rating is not available for all peers. Only the peers that have a credit rating and are investment-grade will be included in the calculation of the relevant gearing. This corresponds to an S&P credit rating of BBB- or higher or an equivalent credit rating from Moody's. Table 8 lists the peers for each peer group that are included for the calculation of the gearing, as well as their accompanying gearing.

Table 8. Gearing

Peer group	**Credit Rating**	**Debt/Equity**	**Debt/Assets**
Energy: production & distribution		*Median 0.73*	*Median 0.42*
American Electric Power Company, Inc.	BBB	0.74	0.43
Edison International	BBB+	0.61	0.38
PNM Resources, Inc.	BBB+	0.93	0.48
VERBUND AG	BBB	0.71	0.42
Energy: production only		*Median -*	*Median -*
-		-	
Combined		*Median 0.73*	*Median 0.42*
Acea S.p.A.	BBB	0.94	0.48
American Electric Power Company, Inc.	BBB	0.74	0.43
American States Water Company	A+	0.22	0.18
California Water Service Group	A+	0.44	0.30
Edison International	BBB+	0.61	0.38
PNM Resources, Inc.	BBB+	0.93	0.48
Severn Trent PLC	BBB-	1	0.50
VERBUND AG	BBB	0.71	0.42

[3] These definitions have been taken from: The WACC for KPN and FttH, Brattle, 1 July 2015.

This table shows that there are no peers in the peer group ´energy: production only" with a known credit rating. Since the median gearing levels of the other two peer groups are the same, ACM chooses to follow this level of gearing. For each of the peer groups, ACM estimates the gearing to be equal to 0.42 (Debt over Assets).

5.2 Tax

The ACM method prescribes that the tax rate is equal to the applicable tariff for the regulated entity. The tax rate is used in the calculation of the WACC. In this case, ACM uses the applicable rate of 5%.[4]

In addition, the tax rate is used to convert the equity bèta into an asset bèta. In this case, the applicable tax rate of the peer in question is used. This tax rate is calculated over the same period as the period used for the bèta. The rates come from the Corporate Tax Rate Table that has been provided by KPMG.[5]

6 Cost of Equity

The Cost of Equity is calculated using the Capital Asset Pricing Model (CAPM). The CAPM is a model with which the expected return of the equity is calculated based on the average return on the market (the Equity Risk Premium), the risk-free rate and the bèta of a company. The financial world and regulators consider the CAPM to be the most appropriate model for calculating the WACC. With the CAPM, it is possible only to calculate the systematic risk that a company bears, and to exclude the non-systematic risks (see also chapter 2).

The formula of the CAPM is as follows.

$$R_e = R_f + \beta_e * ERP$$

In which:
Re = Return on equity
Rf = Risk free rate (Chapter 6.1)
βe = Equity Bèta (Chapter 6.2)
ERP = Equity Risk Premium (Chapter 6.3)

6.1 Risk-free rate

The risk-free rate is the return that is associated with the return on investing in a risk-free object. As there is no such thing as a risk-free object, ACM uses a proxy. It is widely accepted that government bonds are the least risky objects. For calculating the risk-free rate for the Caribbean Netherlands, ACM takes the risk-free object for each region. For each region, the government

[4] http://www.belastingdienst-cn.nl/bcn/nl/zakelijk/vanaf-belastingjaar-2011/opbrengstbelasting/wat-is-het-tarief
[5] https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources.html

bond of the country with the lowest return is used, and those are currently Germany in Europe, the USA in North America, and Chile in Latin America.

For a regulatory period of 3 years, a historical reference period of 3 years turned out to be the best predictor.[6] Although today (the spot rate, the most recent, observed risk-free rate) should be the best indicator for tomorrow, the spot rate has the risk of not being representative for the future. The risk-free rate could be very volatile in a short-term period, which is not desirable. Therefore, ACM calculates the average yield over a period of three years.

This is the average yield of a government bond with a maturity of ten years and based on daily observations. ACM uses government bonds with a maturity of ten years since these are traded in a more liquid market. Next to this, it is common in the financial world to use ten years government bonds.

Table 9 shows the risk-free rate for each region. The average risk-free rate is equal to 2.77%.

Table 9: Risk-free rate

Region	Europe	North America	Latin America
2013	1.63	2.33	5.54
2014	1.23	2.53	4.50
2015	0.54	2.13	4.47
average	1.13	2.33	4.84
Overall average		2.77	

6.2 Bèta

Under the CAPM, the bèta parameter is used to measure the risk that the investor bears by investing in a specific company or activity in relation to the risk of investing in the market portfolio.

The bèta is measured as the correlation between the expected return of a specific asset and the expected return of the market portfolio. This correlation is known as the systematic risk associated with the asset, equating to the risk that an investor cannot diversify away by holding the market portfolio. Since expected returns are not observable, the bèta is usually measured using historical returns of the asset and the market.

The ACM method prescribes that the equity bèta will be estimated based on the peers. Since BCCF identified three different peer groups that each bear different kinds of risks, bèta

[6] A historical reference period of 3 years gives the lowest prediction error. See Hartog van Banda, M., & Mulder, M. (2013). Forecasting the yield on 10-year State bonds as part of the WACC for regulated industries. International Research Journal of Applied Finance, IV(2), 174 - 185.

estimates for each of the three activities are required to measure the systematic risk associated with each.

Of these peers, the equity bèta is estimated by taking the covariance between the return on the asset and the return of the market index where the asset is traded. In this case, daily data over a period of three years will be used. Afterwards, several statistical tests and adjustments will be done.[7]

The equity bètas are influenced by the gearing of the specific peer. To remove the influence of debt, the asset bèta will be calculated. The asset bèta gives the risk if the company were financed with 100% equity. Therefore, the asset bètas are comparable to each other. The equity bèta will be converted into an equity bèta using the Modigliani Miller formula.

In normal circumstances, the equity bèta will be higher than the asset bèta, since the equity-holders bear the risks over the assets. After all, the debt-holders, in normal circumstances, always get their compensation. However, in the case of Centralschweizerische Kraftwerke AG (see table 10), the gearing is negative. Therefore, the risk-bearing capital is higher than the value of the assets. The asset bèta for this company is thus higher than the equity bèta.

Table 10: Bèta calculation Electricity: production and distribution

Peer group	Equity Bèta	Gearing	Asset Bèta
American Electric Power Company, Inc.	0.54	0.74	0.37
Centralschweizerische Kraftwerke AG	0.14	-0.10	0.15
Edison International	0.78	0.61	0.57
EDP - Energias do Brasil S.A.	0.73	0.62	0.52
Eneva S.A.	0.42	3.68	0.12
Pampa Energia SA	1.12	0.31	0.93
PNM Resources, Inc.	0.63	0.93	0.40
Public Power Corporation S.A.	1.21	2.79	0.40
VERBUND AG	0.58	0.71	0.38
		Mediaan	*0.40*

[7] ACM tests for autocorrelation using the durbin-watson test and breusch-godfrey test. In case of autocorrelation, weekly data is used instead of daily data. Robustness is tested using the white test. In case of robustness, white standard errors are used. Finally, the Vasicek correction is executed.

Table 11: Bèta calculation Electricity: production only

Peer group	Equity Bèta	Gearing	Asset Bèta
Albioma	0.55	0.93	0.34
Atlantic Power Corporation	1.09	4.22	0.31
CPFL Energias Renovaveis SA	0.09	0.75	0.06
Endesa Americas SA	1.26	0.39	0.97
Falck Renewables S.p.A.	0.89	1.88	0.39
NRG Yield, Inc. Class A	1.17	1.15	0.69
Talen Energy Corp	1.24	2.67	0.48
Tractebel Energia S.A.	0.81	0.10	0.76
Zespol Elektrowni Patnow Adamow Konin SA	0.84	0.82	0.51
		Mediaan	*0.48*

Table 12: Bèta calculation Electricity and Water combined

Peer group	Equity Bèta	Gearing	Asset Bèta
Acea S.p.A.	0.61	0.94	0.37
Aguas Andinas S.A.	0.45	0.34	0.36
American Electric Power Company, Inc.	0.54	0.74	0.37
American States Water Company	0.71	0.22	0.63
Aqua America. Inc.	0.61	0.36	0.50
California Water Service Group	0.64	0.44	0.51
Centralschweizerische Kraftwerke AG	0.14	-0.10	0.15
Cia de Saneamento do Parana SA	0.81	0.74	0.54
Companhia de Saneamento de Minas Gerais	0.91	0.91	0.57
Edison International	0.78	0.61	0.57
EDP - Energias do Brasil S.A.	0.73	0.62	0.52
Eneva S.A.	0.42	3.68	0.12
Pampa Energia SA	1.12	0.31	0.93
PNM Resources, Inc.	0.63	0.93	0.40
Public Power Corporation S.A.	1.21	2.79	0.40
Severn Trent PLC	0.72	1.00	0.40
United Utilities Group PLC	0.73	1.09	0.39
VERBUND AG	0.58	0.71	0.38
		Median	*0.40*

Finally, the applicable equity bètas for the companies in the Caribbean Netherlands are calculated by converting the asset bèta back into an equity bèta, using the applicable tax rate of 5% (chapter 5.2) and the estimated gearing (chapter 5.1). The results from this convention can be found in table 13.

Table 13: Equity bètas

Peer group	Asset bèta	Gearing	Tax	Equity bèta
Electricity – Production and distribution	0.40	0.73	5%	0.68
Electricity – production only	0.48	0.73	5%	0.80
Electricity & Water combined	0.40	0.73	5%	0.68

6.3 Equity risk premium

The Equity Risk Premium (ERP) represents the extra expected return of the market on top of a risk-free investment. Investors require an extra return as investing in the market is more risky than investing in the risk-free object.

The ACM method prescribes that this premium will be based on the historic ERP (ex post) and/or the expectations on the ERP (ex ante).

Historical ERP

The ERP is determined by several factors and circumstances in the capital market. By using historical data, it can be estimated what premium investors were able to get in the past in order to be compensated for such circumstances. Therefore, it is important to use a period of data that is as long as possible in order to determine the historical ERP. By using a long period of data, the ERP will reflect multiple circumstances that have occurred on the capital market in the past, and perhaps may occur in the future. By taking a long period of data, it is prevented that the ERP will be distorted by specific market circumstances that occurred in some short time period. Therefore, a long period of data is assumed to be the best estimator (according to investors) for the future expected premium.

To calculate this historical ERP, ACM uses ERP from the report of Dimson, Marsh and Staunton (DMS).[8] This is an extensive study on the level of the ERP, in 23 countries during a period from 1900 to 2015.

Scientists[9] are divided about the question whether the arithmetic average or the geometric average should be used to calculate the historical ERP. Therefore, ACM calculates the ERP based on both methods (weighting: 50%).
Both the arithmetic average as the geometric average of the ERP will be calculated based on the current market capitalization of each country's stock market.

[8] Credit Suisse Research Institute, Credit Suisse Global Investment Returns Yearbook 2016.

[9] Smithers rapport (2003); P. Fernandez, The Equity Premium in 150 Textbooks, Journal of Financial Transformation, 2009, vol. 27, pages 14-18.

Table 14 lists the arithmetic mean and geometric mean for the ERP using data from 1900 to 2015 for the Eurozone economies reported by DMS.[10] Each country's ERP is weighted by the current market capitalization of the main stock market in that country, in line with a typical European investor's behavior of placing more weight in a portfolio on stocks in countries with larger stock markets.

Table 14: Equity risk premium DMS - Europe

	Geometric Mean	Arithmetic Mean	Average	Current Market Cap (€m)
Austria	2.60%	21.50%	12.05%	57,186
Belgium	2.40%	4.50%	3.45%	370,025
Finland	5.20%	8.80%	7.00%	232,741
France	3.00%	5.40%	4.20%	1,207,717
Germany	5.10%	8.50%	6.80%	974,926
Ireland	2.80%	4.80%	3.80%	125,688
Italy	3.10%	6.50%	4.80%	394,484
The Netherlands	3.30%	5.60%	4.45%	509,979
Portugal	2.70%	7.50%	5.10%	53,151
Spain	1.80%	3.80%	2.80%	526,421
Average Eurozone	*3.20%*	*7.69%*	*5.45%*	
Weighted Average Europe (Current)	*3.41%*	*6.33%*	*4.87%*	

Table 15 lists the arithmetic mean and geometric mean for the ERP using data from 1900 to 2015 for the USA reported by DMS. Since this is just one economy, there is no need to calculate a weighted average using market caps.

Table 15: Equity risk premium DMS - USA

	Geometric Mean	Arithmetic Mean	Average
USA	4.3%	6.4%	5.35%

Region

ACM calculates the ERP as the average of the ERP for Europe and the US. Ideally, ACM would include the ERP for Latin America. However, DMS does not report any ERPs for countries or regions in Latin America. DMS does report a World ERP, which is based on the 23 biggest economies in the world. No Latin American countries are included in these 23 economies. Despite that ACM believes a world ERP should be a better proxy, ACM chooses not use this

[10] Dimson, Marsh, Staunton (February 2016): "Credit Suisse Global Investment Returns Sourcebook 2016", p28. Note: (1) For Austria and Germany, statistics are based on 114 years, excluding 1921-22 for Austria and 1922-23 for Germany. Source: Elroy Dimson, Paul Marsh, and Mike Staunton, Triumph of the Optimists, Princeton University Press, 2002, and subsequent research. (2) Market Cap values are as of 29/03/2016, calculated by NERA, see 'Estimating the WACCs for FTR-MTR, July 2016..

ERP because it is lower[11], than the average of the calculated ERP for Europe and the USA above. ACM believes that this would underestimate the true ERP for the three regions combined.[12]

Ex ante ERP

It is expected that the ERP calculated over a period of 110 years will be overestimated. Markets have been more liquid over the past 20 years, and this should lead to lower premiums. Therefore a downward adjustment is often made to the ERP.

On the other hand, ex ante estimates on the Equity Risk Premium (based on the Dividend Growth model) imply that the ERP estimation based on historical data is an underestimation and should be adjusted upwards.

ACM has no reason to assume that any one of these opposed effects is stronger. Therefore, the ERP will *not* be adjusted. This is in line with other WACC decisions that ACM prepared or that different consultants had prepared for ACM.

[11] Geometric mean of 3.2% and Arithmetic mean of 4.4%. The average (50-50) is equal to 3.8%

[12] Many of the countries in Latin America are classified as emerging markets, such as Brazil and Chile. Emerging markets data provide special challenges, since the behavior of emerging market returns differs significantly from the developed equity market returns. It is a well-known fact that the average ERP in emerging markets is higher than that in developed markets, although the reasons as to why this is remain unclear. Also, the ERP for countries in Latin America are, on average, high compared with developed countries.
Sources: Bekaert, G., Erb, C. B., Harvey, C. R., & Viskanta, T. E. (1998). The behavior of emerging market returns. In *Emerging Market Capital Flows* (pp. 107-173). Springer US.
Donadelli, M., & Persha, L. (2014). Understanding emerging market equity risk premia: Industries, governance and macroeconomic policy uncertainty. *Research in International Business and Finance*, *30*, 284-309.

7 Cost of Debt

The Cost of Debt will be calculated using the following formula:

$$R_d = R_f + DP + Fee$$

Where:
Rd = Return on Debt
Rf = Risk free rate (Chapter 7.1)
DP = Debt Premium (Chapter 7.1)
Fee = Non-interest fee[13]

7.1 Debt premium and risk free rate

The Debt Premium is the difference between the risk-free rate and the Cost of Debt. It represents the return associated with the risk (extra or otherwise) of buying a company's bond over investing in the risk-free object. The ACM method prescribes calculating the debt premium based on the average credit spread on bonds of comparable companies with a maturity of ten years. For these comparables companies, indices are found that represent these companies. These indices are composed by Bloomberg based on a variety of companies.

For each region, an index on the return on corporate bonds of BBB-rated utility companies has been identified.[14] ACM has also identified the risk-free rate as the return on the least risky government bonds in that region. The least risky government bonds are the ones with the lowest returns. For North America, Latin America and Europe, these are the USA, Chile, and Germany respectively.

For calculating the cost of debt, ACM considers that companies have existing debt. ACM compensates for the existing debt by using a longer reference period for debt than for equity. ACM assumes that the portfolio of debt has obligations for ten years and an annual spread that is equally divided. ACM also uses this method for calculating the WACC for energy regulation in the Netherlands.

To calculate the Cost of Debt ACM uses seven years of historical data. The most recent three years of this data are used to estimate the cost of debt of the future three years of the new regulatory period.[15] Combined with the seven historical years this makes a reference period of ten years.

[13] Compensation for transaction costs is 15 basis points

[14] In line with the gearing, ACM deviates from the method by choosing an index with a BBB-rating in stead of an A-rating.

[15] Following the reference period as used for the risk-free rate (chapter 6.1)

Mathematically, this means ACM calculates a seven-year average in which the 3 most recent years weigh twice as much. The results are summarized in table 16.

Table 16: Debt Premium

	Cost of Debt			Risk-free Rate			Debt Premium		
	EU	US	Chile	EU	US	Chile	EU	US	Chile
2009	4.87	6.08	6.26	3.27	3.24	5.35	1.60	2.84	0.91
2010	4.23	4.87	4.86	2.78	3.19	[16]	1.45	1.68	[16]
2011	4.68	4.32	4.74	2.65	2.76	5.82	2.04	1.56	-1.09
2012	3.91	3.68	5.35	1.56	1.78	5.38	2.34	1.89	-0.02
2013	3.51	3.95	5.05	1.63	2.33	5.54	1.89	1.62	-0.49
2014	2.31	3.70	5.68	1.23	2.53	4.50	1.08	1.17	1.18
2015	1.59	3.65	5.73	0.54	2.13	4.47	1.06	1.52	1.26
2016	*2.47*	*3.77*	*5.49*	*1.13*	*2.33*	*4.84*	*1.34*	*1.44*	*0.65*
2017	*2.47*	*3.77*	*5.49*	*1.13*	*2.33*	*4.84*	*1.34*	*1.44*	*0.65*
2018	*2.47*	*3.77*	*5.49*	*1.13*	*2.33*	*4.84*	*1.34*	*1.44*	*0.65*
Average	3.25	4.15	5.47	1.71	2.50	5.06	1.55	1.66	0.41
		4.29			3.09			1.21	

The average Cost of Debt over the described period and the regions equals 4.29%. The average risk-free rate is equal to 3.09%. This results in a Debt Premium of 1.21%.

8 Real WACC

All the calculations are used to calculate the nominal WACC. In this nominal WACC, a compensation for inflation is also included, which must be done, but only once. If the regulatory asset base (RAB) were also indexed by inflation, and a nominal WACC were used, you would have compensated for inflation twice. Therefore, the real WACC must be used. To calculate the real WACC, an inflation rate is needed. This must be the same inflation rate as the inflation rate that is used to index the RAB. For the Caribbean Netherlands, this is an inflation rate for Bonaire, St. Eustasius, and Saba respectively.

8.1 Inflation

The ACM method prescribes that inflation will be calculated using historical and forecasted rates of inflation (both 50%).

In table 9, the historical and forecasts rates of inflation of Bonaire, St. Eustasius and Saba have been listed.[17]

[16] In 2010 an earthquake occurred in Chile which caused turmoil on the financial markets. The data from this year is omitted.

[17] http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=81122NED&D1=0&D2=0&D3=a&D4=a&VW=T

At the moment, there is no sufficient forecast for the inflation in the Caribbean Netherlands for the upcoming years. Therefore, ACM chooses to use an expected inflation rate of the USA, since the currency in the Caribbean Netherlands is the American Dollar (USD).[18]

Table 17: Historical and forecasted rates of inflation

Year	Bonaire	Sint Eustatius	Saba
Q4 2012- Q4 2013	1.20%	2.09%	1.17%
Q4 2013- Q4 2014	0.86%	1.56%	2.06%
Q4 2014- Q4 2015	-1.20%	-0.65%	-0.14%
Average history	0.29%	1.00%	1.03%
Expectations 2016	1.07%	1.07%	1.07%
Expectations 2017	2.02%	2.02%	2.02%
Average expactations	1.55%	1.55%	1.55%
Average history and expectations	0.92%	1.27%	1.29%

8.2 Nominal and Real WACC per company

In table 18, the nominal WACCs[19] for each company will be converted to a real WACC using the applicable inflation rate, being the inflation rate of the island on which the company is situated. The conversion to a real WACC will be done using the following formula:

$$Real\ WACC\ =\ (1\ +\ Nom\ Pretax\ WACC)\ /\ (1\ +\ inflation)\ -\ 1$$

Tabel 18: Nominal and Real WACC per company

Company	Island	WACC	Nominal WACC (pretax)	Inflation Rate	Real WACC (pretax)
WEB	Bonaire	Electricity & water combined	5.68%	0.92%	4.72%
CG	Bonaire	Electricity, production only	6.06%	0.92%	5.09%
STUCO	St. Eustasius	Electricity & water combined	5.68%	1.27%	4.36%
SEC	Saba	Electricity, production and distribution	5.68%	1.29%	4.34%

[18] https://data.oecd.org/price/inflation-forecast.htm

[19] For final calculation of the nominal WACC, see table 1.

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Appendix A – Gearing

Company	Credit rating	Debt/equity	Debt/assets	Credit rating
American Electric Power Company, Inc.	BBB	0,7422	0,4260	BBB
Centralschweizerische Kraftwerke AG	#N/A N/A	-0.1039	-0.1160	#N/A N/A
Edison International	BBB+	0.6124	0.3798	BBB+
EDP - Energias do Brasil S.A.	Ba3	0.6234	0.3840	Ba3
Eneva S.A.	#N/A N/A	3.6824	0.7864	#N/A N/A
Pampa Energia SA	#N/A N/A	0.3129	0.2383	#N/A N/A
PNM Resources, Inc.	BBB+	0.9338	0.4829	BBB+
Public Power Corporation S.A.	CCC-	2.7864	0.7359	CCC-
VERBUND AG	BBB	0.7133	0.4163	BBB
Albioma	#N/A N/A	0.9341	0.4830	#N/A N/A
Atlantic Power Corporation	B+	4.2182	0.8084	B+
CPFL Energias Renovaveis SA	#N/A N/A	0.7501	0.4286	#N/A N/A
Endesa Americas SA	#N/A N/A	0.3903	0.2807	#N/A N/A
Falck Renewables S.p.A.	#N/A N/A	1.8831	0.6532	#N/A N/A
NRG Yield, Inc. Class A	BB+	1,1478	0,5344	BB+
Talen Energy Corp	#N/A N/A	2,6708	0,7276	#N/A N/A
Tractebel Energia S.A.	#N/A N/A	0.1039	0.0941	#N/A N/A
Zespol Elektrowni Patnow Adamow Konin SA	#N/A N/A	0.8165	0.4495	#N/A N/A
Acea S.p.A.	Baa2	0.9400	0.4845	Baa2
Aguas Andinas S.A.	#N/A N/A	0.3401	0.2538	#N/A N/A
American States Water Company	A+	0.2161	0.1777	A+
Aqua America, Inc.	#N/A N/A	0.3551	0.2621	#N/A N/A
California Water Service Group	A+	0.4360	0.3036	A+
Cia de Saneamento do Parana SA	#N/A N/A	0.7401	0.4253	#N/A N/A
Companhia de Saneamento de Minas Gerais	B1	0.9123	0.4771	B1
Severn Trent PLC	BBB-	1.0030	0.5007	BBB-
United Utilities Group PLC	#N/A N/A	1.0890	0.5213	#N/A N/A

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Appendix B – Bèta

			OLS regression											Market average				Weighting					
Firm	Country	Ticker	Index	Heteroske	Autocorre	DW	BGOD(7)	White	Beta daily	SE daily	SE daily (r	Beta weel	SE weekly	BETA	SE	Beta2	St Error	Company beta	Market Beta	Vasicek Beta	Gearing (D/E)	Taks (%)	Asset beta
Acea S.p.A.	Italy	ACE IM EQUITY	SXXE:IND	NO	NO	1,681	6,655	2,35	0,605	0,04523				0,605	0,04523	1	0,36	0,984460168	0,015540	0,61114	0,94	0,314	0,37
Aguas Andinas S.A.	Chile	AGUAS/A CI EQUITY	IPSA:IND	YES	YES	1,518	17,788	12,09	0,446	0,04472		0,415	0,115	0,415	0,115	1	0,36	0,984803342	0,015197	0,45442	0,34	0,215	0,36
Albioma	France	ABIO FP EQUITY	SXXE:IND	NO	NO	1,645	1,273	2,99	0,54399	0,0463				0,54399	0,0463	1	0,36	0,983728329	0,016272	0,55141	0,93	0,3333	0,34
American Electric Power Company, Inc.	US	AEP US EQUITY	SPX:IND	NO	NO	1,51	6,742	3,56	0,5299	0,0437				0,5299	0,0437	1	0,36	0,985478713	0,014521	0,53673	0,74	0,4	0,37
American States Water Company	US	AWR US EQUITY	SPX:IND	NO	YES	1,7344	20,754	0,41	0,7019	0,06003		0,613	0,1338	0,613	0,1338	1	0,36	0,972946671	0,027053	0,70996	0,22	0,4	0,63
Aqua America, Inc.	US	WTR US EQUITY	SPX:IND	NO	YES	1,644	22,786	4,91	0,6019	0,04306		0,4877	0,0922	0,4877	0,0922	1	0,36	0,98589498	0,014105	0,60752	0,36	0,4	0,50
Atlantic Power Corporation	US	AT US EQUITY	SPX:IND	NO	NO	1,587	8,958	1,23	1,102	0,1369				1,102	0,1369	1	0,36	0,873659117	0,126341	1,08911	4,22	0,4	0,31
California Water Service Group	US	CWT US EQUITY	SPX:IND	YES	YES	1,699	8,197	6,46	0,6318	0,0583		0,60668	0,134025	0,60668	0,134025	1	0,36	0,974444223	0,025556	0,64121	0,44	0,4	0,51
Centralschweizerische Kraftwerke AG	Switzerland	CKWN SW EQUITY	SMI:IND	NO	YES	0,83	28,83	2,82	0,052	0,11195		-0,0333	0,14455	-0,0333	0,14455	1	0,36	0,911823293	0,088177	0,13559	-0,10	0,17935	0,15
Cia de Saneamento do Parana SA	Brazil	SAPR3 BZ EQUITY	IBOV:IND	NO	NO	1,571851	6,872	0,25	0,808	0,045				0,808	0,045	1	0,36	0,984615385	0,015385	0,81095	0,74	0,34	0,54
Companhia de Saneamento de Minas Gerais	Brazil	CSMG3 BZ EQUITY	IBOV:IND	NO	YES	1,6939	16,,974	0,59	0,5787	0,705989		0,813386	0,146415	0,813386	0,146415	1	0,36	0,206362701	0,793637	0,91306	0,91	0,34	0,57
CPFL Energias Renovaveis SA	Brazil	CPRE3 BZ EQUITY	IBOV:IND	NO	YES	14,45	20,489	0,08	0,085129	0,0344		0,1328	0,0852	0,1328	0,0852	1	0,36	0,990951754	0,009048	0,09341	0,75	0,34	0,06
Edison International	US	EIX US EQUITY	SPX:IND	NO	NO	1,508	4,815	4,44	0,435	0,452				0,435	0,452	1	0,36	0,388135512	0,611864	0,78070	0,61	0,4	0,57
EDP - Energias do Brasil S.A.	Brazil	ENBR3 BZ EQUITY	IBOV:IND	YES	YES	1,8688	30,618	7,26	0,72388	0,04388		0,681145	0,116	0,681145	0,116	1	0,36	0,985360595	0,014639	0,72792	0,62	0,34	0,52
Endesa Americas SA	Chile	ENDESAAM CI EQUITY	IPSA:IND	NO	NO	1,15	10,349	0,51	1,502472	0,342174				1,502472	0,342174	1	0,36	0,525370665	0,474629	1,26398	0,39	0,215	0,97
Eneva S.A.	Brazil	ENEV3 BZ EQUITY	IBOV:IND	NO	NO	1,484	7,735	2,58	0,3424	0,12989				0,3424	0,12989	1	0,36	0,8848143	0,115186	0,41815	3,68	0,34	0,12
Falck Renewables S.p.A.	Italy	FKR IM EQUITY	SXXE:IND	YES	NO	1,574	10,534	7,89	0,883746	0,048008				0,883746	0,048008	1	0,36	0,982527388	0,017473	0,88578	1,88	0,314	0,39
NRG Yield, Inc. Class A	US	NYLD US EQUITY	SPX:IND	NO	NO	1,4738	2,592	1,89	1,203	0,1696				1,203	0,1696	1	0,36	0,818366984	0,181633	1,16613	1,15	0,4	0,69
Pampa Energia SA	Argentina	PAMP AR EQUITY	MERVAL:I	YES	NO	1,402	4,898	6,41	1,119672	0,0366	0,03772			1,119672	0,0366	1	0,36	0,989769631	0,010230	1,11845	0,31	0,35	0,93
PNM Resources, Inc.	US	PNM US EQUITY	SPX:IND	NO	NO	1,528	5,467	2,29	0,6247	0,0496				0,6247	0,0496	1	0,36	0,981370915	0,018629	0,63169	0,93	0,4	0,40
Public Power Corporation S.A.	Greece	PPC GA EQUITY	SXXE:IND	YES	NO	1,5977	9,291	12,35	1,229	0,1209	0,155826			1,229	0,155826	1	0,36	0,898646975	0,101353	1,20579	2,79	0,275	0,40
Severn Trent PLC	UK	SVT LN EQUITY	ASX:IND	YES	NO	1,516	3,109	10,35	0,7204	0,0354	0,04337			0,7204	0,04337	1	0,36	0,990423158	0,009577	0,72308	1,00	0,21083	0,40
Talen Energy Corp	US	TLN US EQUITY	SPX:IND	NO	NO	1,493	6,317	0,21	1,308	0,1981				1,308	0,1981	1	0,36	0,767574207	0,232426	1,23641	2,67	0,4	0,48
Tractebel Energia S.A.	Brazil	TBLE3 BZ EQUITY	IBOV:IND	YES	YES	1,68	27,29	12,47	0,67	0,306		0,601	0,0564	0,601	0,0564	1	0,36	0,580551524	0,419448	0,80842	0,10	0,34	0,76
United Utilities Group PLC	UK	UU/ LN EQUITY	ASX:IND	YES	NO	1,679	6,407	25,4	0,7269	0,038	0,511569			0,7269	0,511569	1	0,36	0,9889808	0,011019	0,72991	1,09	0,21083	0,39
VERBUND AG	Austria	VER AV EQUITY	SXXE:IND	NO	NO	1,506	9,809	1,81	0,5758	0,04268				0,5758	0,04268	1	0,36	0,986139397	0,013861	0,58168	0,71	0,25	0,38
Zespol Elektrowni Patnow Adamow Konin SA	Poland	ZEP PW EQUITY	SXXE:IND	NO	YES	1,308	6,62	0,09	0,207	0,725		0,116787	0,164	0,116787	0,164	1	0,36	0,197794651	0,802205	0,84315	0,82	0,19	0,51