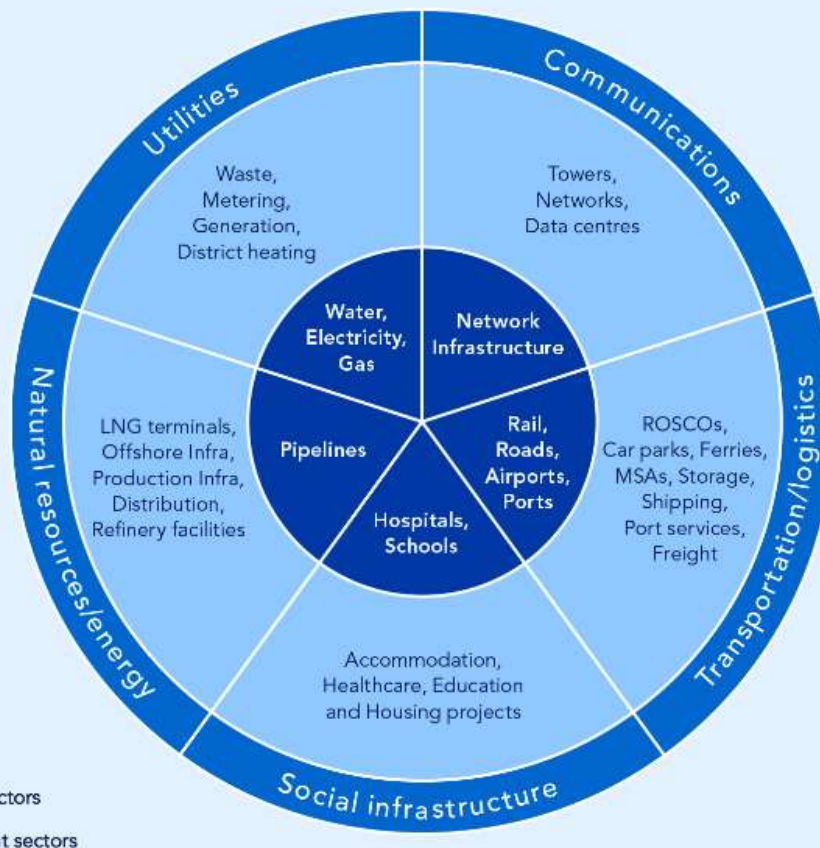


Konferenz
Kommunales
Infrastruktur-
Management
(KIM)

Electricity Grids as an Asset Class, Pricing and Valuation

1. Infrastructure as an Asset Class



- Provision of essential services;
- significant barriers to entry and a generally dominant market position;
- long duration assets, often with a life of 30+ years;
- have high upfront costs, but low ongoing operational costs;
- long-term, stable cash flows, generally with low volatility compared to other asset classes;
- inflation-linked contracts and pricing

Sources: <https://www.3i-infrastructure.com/about-us/infrastructure-asset-class/>
<http://www.ampcapital.com.au/resources/investment-basics/what-is-infrastructure-and-why-invest>

2. Theoretical Consideration to regulate Monopolies

- Sector-specific regulation of monopolies is not a new concept. In the US, cost-based regulation, especially in the form of so-called rate-of-return regulation, has a long tradition.
- In Europe, the monopoly problem tended to be counterbalanced by state ownership, with the result that economic regulation was less important.
- In the privatization and liberalization of British Telecom in 1983, Professor Stephan Littlechild proposed a price-based regulation known as "RPI-X." His main argument was that cost-based regulation does not incentivize cost efficiency.
- In 1990, the "RPI-X" regulation was first used for electricity grids in the UK. The "RPI-X" regulation became a worldwide success story and was used in Germany in 2009 under the name "incentive regulation" for energy networks.

Sources: DENA Verteilnetzstudie, Berlin Dezember 2012, Kapitel 11.1

3. Incentive Regulation (Anreizregulierung)

The core of the regulation is on the one hand the allocation of the costs and on the other hand the correction factor X.

Capital costs = $KA_{dnb,t}$ (fixed costs) + $KA_{vnb,0}$ (medium term fixed costs) + $KA_{b,0}$ (short term fixed costs or costs which can't be influenced in the short term)

Short and medium term fixed costs are reduced over time with the correction factor X.

Total costs = capital costs + operating costs

Capital costs = $WACC \cdot RAB + AfA$

WACC = Weighted Average Cost of Capital

RAB = Regulatory Asset Base

AfA = Calculated Depreciation (“kalkulatorische Abschreibung”)

Sources: DENA Verteilnetzstudie, Berlin Dezember 2012, Kapitel 11.1, p. 269

4. Weighted Average Cost of Capital (WACC)

The WACC is a combination of debt and equity costs.

$$r_{Equity} = i + (r_{Market} - i) \times \beta$$

with

r_{Equity} = Equity return

i = Risk free rate

r_{Market} = Return of the market portfolio

β = Company specific market risk

$$WACC = \% \text{ Equity} \times r_{Equity} + \% \text{ Debt} \times i_{Debt}$$

with i_{Debt} = Interest rate debt

5. The Equity beta (β)

$$\beta = \frac{\text{Covariance}(r_{\text{Equity}}, r_{\text{Market}})}{\text{Variance}(r_{\text{Equity}})}$$

The beta factor can be used to form three groups of securities:

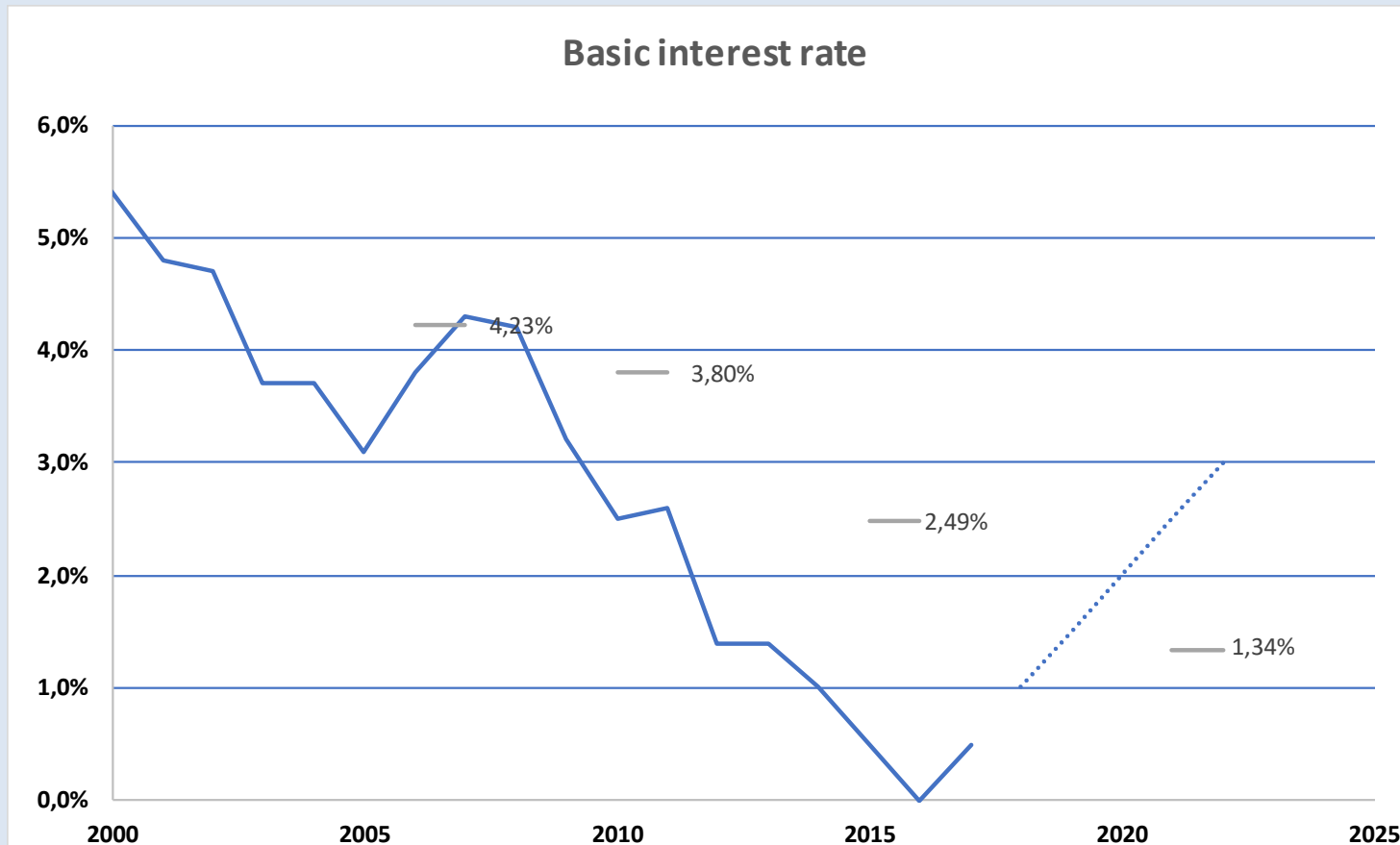
$\beta > 1$: The security is fluctuating more than the overall market.

$\beta = 1$: The security moves equal to the overall market.

$\beta < 1$: The security is fluctuating less than the overall market.

Source: <http://www.seqimco.com/research.php?action=viewArticle&articleId=10>

6. Development of the basic interest rate („Basiszinssatz“)



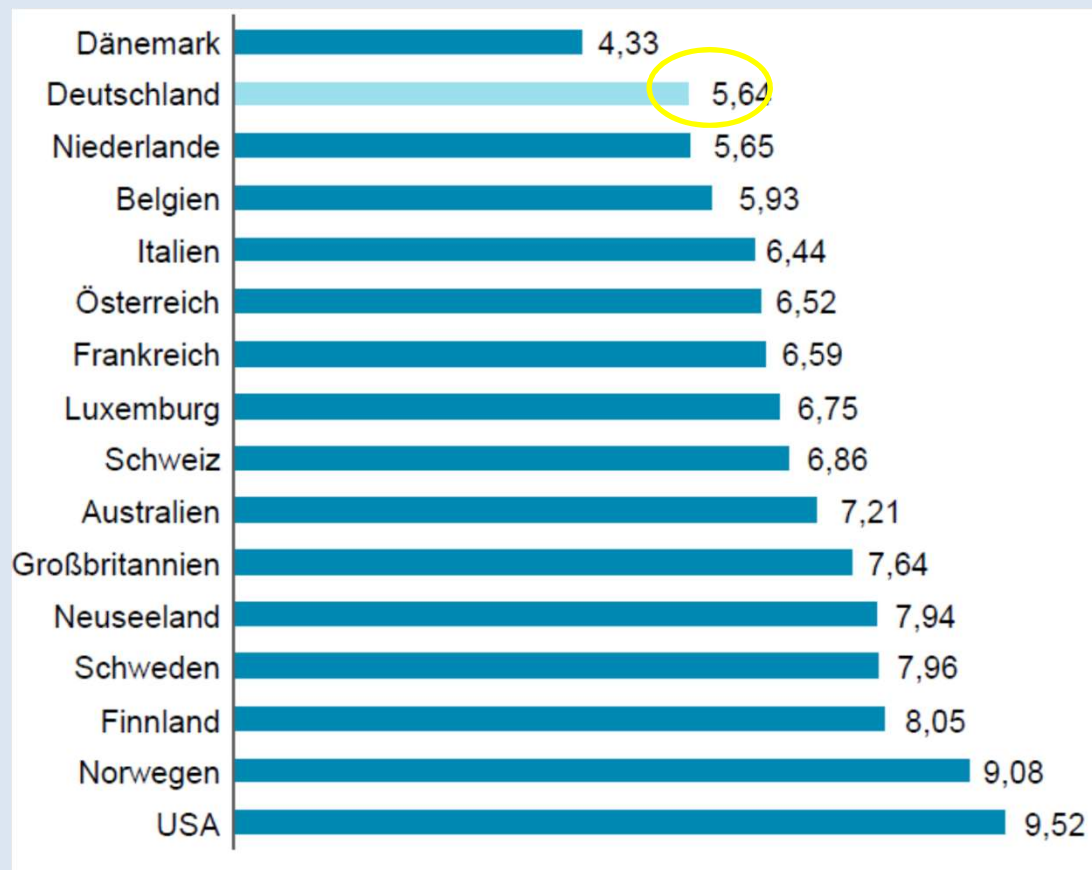
Source: https://www.bundesbank.de/Navigation/DE/Statistiken/Zeitreihen_Datenbanken/Geld_und_Kapitalmaerkte/geld_und_kapitalmaerkte_list_node.html?listId=www_skms_it01

7. Development of the Equity Return (EK-I-Zinssatz) as set by the Federal Network Agency (Bundesnetzagentur)

	1. Regulierungs-P.	2. Regulierungs-P.	3. Regulierungs-P.
Datenstand Basiszins	31.12.2007	31.12.2010	31.12.2015
Datenstand Wagniszuschlag	08.04.2008	08.04.2008	31.12.2015
Basiszinssatz	4,23%	3,80%	2,49%
Wagniszuschlag	3,59%	3,59%	3,15%
Beta-Faktor unverschuldet	0,385	0,385	0,403
Beta-Faktor verschuldet	0,79	0,79	0,83
Marktrisikoprämie	4,55%	4,45%	3,80%
EK-Zinssatz nach Steuern	7,82%	7,39%	5,64%
Steuerfaktor	1,19	1,22	1,22
EK-Zinssatz auf Neuanlagen	9,29%	9,05%	6,91%
Inflation	1,45%	1,55%	1,46%
EK-Zinssatz auf Altanlagen	7,56%	7,17%	5,12%
Beginn der Regulierungsperiode	2009	2014	2019
Ende der Regulierungsperiode	2013	2018	2023

Source: <https://www.bundesnetzagentur.de/DE/Service-Funktionen/Beschlusskammern/Beschlusskammer4/>

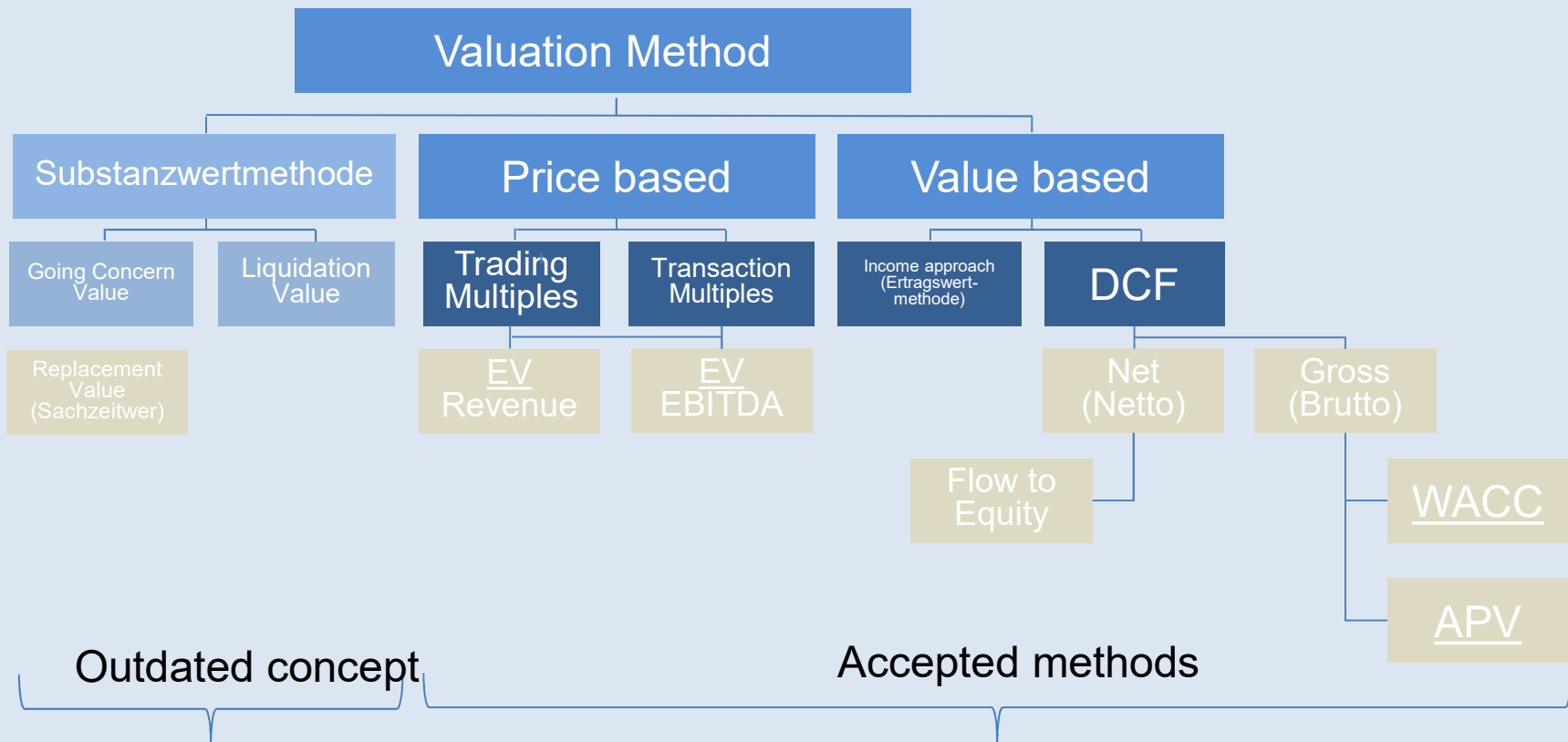
8. Average Equity Return in % (after tax)



Quelle: NERA Analyse von Regulierungsentscheidungen, September 2017

1. Second last rank within Europe.
2. Only country in west Europe which reduces the market risk premium and risk-free interest rate.
3. Deletion of energy transition surcharge (“Energiewende-Zuschlag”).
4. Upper court Düsseldorf (OLG) has decided on 21.03.2018 that Bundesnetzagentur can't reduce the revenue cap as decided.

9. Methods of Company Evaluation



Basically, a distinction for the accepted methods is made between value-oriented and price-oriented methods. Each individual procedure is a cross-check to the other methods

Source: On the basis of Hegel Karbenn & Cie. Corporate Finance GmbH. Theorie und Praxis in der Energiewirtschaft. Januar 2012

10. Transactions Examples

Year of Transaction	2011	2010	2018 (AR 2016)	
Seller	RWE	Vattenfall	IFM	
Buyer	Commerz Real	Elia, IFM	Elia	
(in EUR Mio.)	Amprion	50 Herz	50 Herz	
EBITDA	116,3	124,7	243,4	
EBITDA Multiple	8,0	5,3	20,1	
Enterprise Value	1300,0	861,4	4806,6	
Net Debt	370,0	202,4	-75,9	
Purchase Price (Equity market value)	930,0	659,0	4882,5	
Shares	74,9%	100,0%	20,0%	
Purchase Price Calculation	100%	100%	100%	20%
Regulated Asset Base	1300,0	1338,9	4155,0	831,0
Net debt	370,0	202,4	-75,9	-15,2
Equity Value	930,0	1136,5	4230,9	846,2
Profit from Transaction ("+ Badwill/- Goodwill")	0,0	477,5	-651,6	-130,3
Purchase Price	930,0	659,0	4882,5	976,5

Source: Own calculations, Annual Report 50 Herz 2010, 2016 and EUROGRID, Press Release RWE

11. Transactions Examples

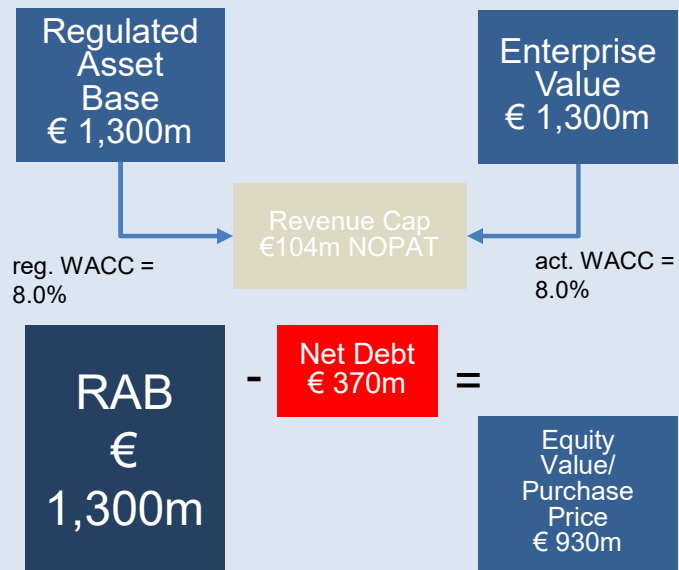
Year of Transaction	2011	2010	2018 (AR 2016)
Seller	RWE	Vattenfall	IFM
Buyer	Commerz Real	Elia, IFM	Elia
Company	Amprion	50 Herz	50 Herz
Profit and Loss (in EUR Mio.)			
Revenue		5595,2	8221,2
Operating Costs		5470,5	7977,8
EBITDA (Operating Profit)	116,3	124,7	243,4 1)
Depreciation (40 years)	32,5	33,5	103,9
EBIT	148,8	158,2	347,3
Tax on EBIT (30%)	-44,6	-47,5	-104,2
NOPAT	104,1	110,7	243,1
Unlevered FCF (Mio. €)	104,1	110,7	243,1 2)
WACC (calc., Buyer)	8,0%	12,9%	5,1%
WACC (reg.)	8,0%	8,3%	5,9%
Enterprise Value	1300,0	861,4	4806,6
Regulated Asset Base	1300,0	1338,9	4155,0

1) EBITDA increase of 25.4% according to Inframation News; 2) Depreciation = Investments

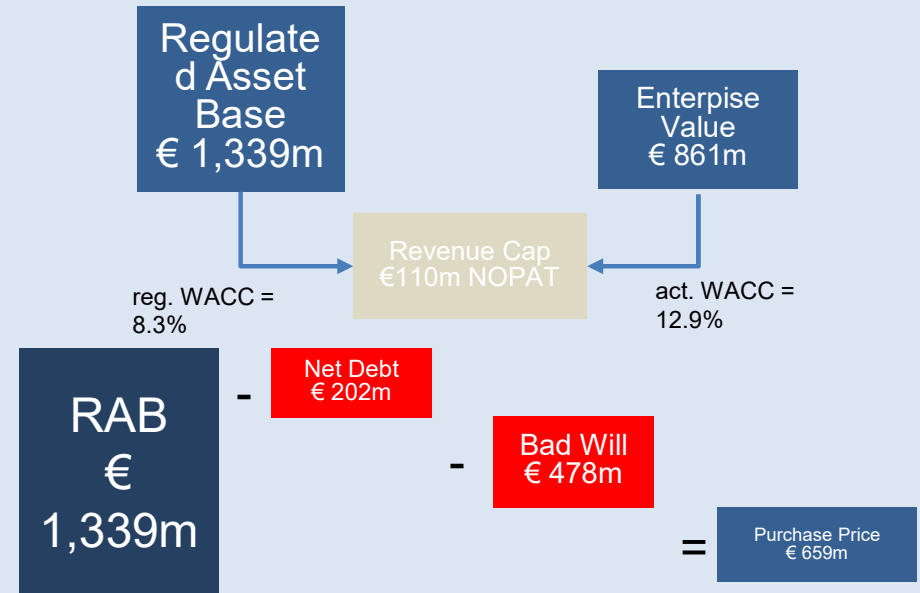
Source: Own calculations, Annual Report 50 Herz 2016 and EUROGRIG, Press Release

12. Regulated Asset Base (RAB) VS. Enterprise Value (EV)

RWE/Amprion 2011



Vattenfall/Elia, IFM 2010



If the regulated WACC equals the actual WACC, than the RAB equals the Enterprise Value, better performance or lower WACC creates a premium on the RAB (and vice versa).

13. Acquisition of 50 Herz in 2018

Debt	Coupon	Maturity	Tenor
500	3,88%	2020	4,0
500	1,88%	2025	9,0
750	1,63%	2023	7,0
140	2,63%	2030	14,0
750	1,50%	2028	12,0
2640	2,12%		8,6
Debt (gearing)	73%	2,12%	1,55%
Equity	27%	13,34%	3,55%
WACC	100%	5,10%	5,10%

Quelle: Own calculations, Annual Report 50 Herz 2016

Thank you for your Attention!