Return Requirements for Regulated Entities in the Gas Industry

Martin EHMER[1], Lukas D. SCHUCHARDT[2], Heinz-Werner UFER[3]

Abstract: *In regulated businesses, utility companies are facing asymmetric risks due to ex-ante regulation. Shareholders have to question whether their business is earning appropriate returns taking into account those asymmetric risks involved. Adequate performance measures need to be designed and installed in order to benchmark the regulated business against alternative investments.*

In our study we analyse the impact of regulation on the process of steering and more precisely on the definition of return requirements in the case of a Central and Eastern Europe gas industry with permanent ex-ante regulation. For this purpose, we examine the absolute return target by its two inputs, the rate of return and the investment basis. We conduct an Analytic Hierarchy Process in order to assess the options for the investment basis used to calculate an absolute return requirement in a structured way. Our findings show a twofold view on return requirements in terms of the time horizon. In short-term, regulatory parameters should be taken into account. However, in long-term those parameters can only serve as a figure to control whether regulatory conditions fulfil the needs of the shareholders. Our study shall contribute to the static analysis of regulation on return requirements and steering in the gas industry after privatization.

Keywords: *AHP; Central and Eastern Europe; Incentive Based Regulation; Unbundling; Steering.*

JEL: *G 28; I 28; I 38.*

Introduction

Utility companies generate a significant portion of their revenue and profit in regulated business. Holding companies as the shareholders of regulated entities have to question whether this business is earning appropriate returns taking into account the risk involved. Appropriate performance measurement and performance requirements need to be designed and installed to continuously benchmark the regulated business against alternative investments and to secure efficient steering of these entities. In the gas industry, the physical network infrastructure is subject to permanent ex-ante regulation due to its bottleneck characteristic in Europe. This study covers the intersection of the field of regulatory economics and return

[1] Business Analyst, TU Dortmund University, Germany
[2] Research Assistant TU Dortmund University, Chair of Accounting and Management Control, Dortmund; Germany; e-mail: lukas.schuchardt@tu-dortmund.de
[3] Assistant Lecturer, TU Dortmund University, Germany

requirements in management science by analysing the impact of regulation on the process of steering and more precisely on the definition of return requirements in the regulated business of the gas industry. The research was supported by a multinational gas parent company (named in this study: P) and its subsidiary (named in this study: S) in an Eastern and Central Europe country (named in this study: E). P serving as shareholder who claims an appropriate return on his investment competing with other investment alternatives on capital markets as well as in internal projects.

Almost exclusively, research on regulation is conducted from an economics point of view while the management science perspective is insufficiently researched (Androniceanu, 2009). The case of the Californian electricity industry (Brand & Scheffran, 2006) from the 1990s until the beginning of this century illustrates how inappropriate measures to enhance competition from an economics point of view lead to security of supply problems if industry and company characteristics are not accounted for. The cooperation with P allows a management science view on regulation and the desired analysis of the impact on return requirements.

The motivation by P for researching this topic is given by two factors: First, by the current interest of investors like private equity and infrastructure funds in infrastructure networks and the necessity to benchmark performance. Second, as the EU imposed legal, organization and decision-making unbundling on the infrastructure operations, separate entities had to be established. This limits the options for steering to the approval of an annual financial plan and the setting of global limits on levels of indebtedness (European Parliament/Council of the EU, 2003). Explicitly prohibited are any instructions concerning day-to-day operations and individual decisions exceeding the level of the annual financial plan, i.e. investment budgets can be controlled but not the single investment decisions and projects (European Parliament/Council of the EU, 2003). Therefore (regulated) returns are used for steering and target setting. The required return as a financial target and key figure thereby takes into account the two important factors in the evaluation of investments: the regulated asset base (RAB) and the rate of return. This study analyses the S distribution system operators (DSO), i.e. the companies operating the low and medium-pressure grid infrastructure, since they are subject to explicit ex-ante regulation. The transmission system operators (TSO) are not part of our study as this would have involved the problem of defining comparable accounting figures for regulated intra-E business and non-regulated transit business. Thereby the ongoing methodological discussion on return requirements and target setting shall be enriched.

1. Regulation and unbundling of S

1.1 Unbundling and the revaluation of the assets

When unbundling the DSOs in E, the network assets were transferred to the newly established companies. Thereby these assets were revaluated according to E generally accepted accounting principles (E-GAAP), i.e. a step up to market values had to be done. A study about repurchase values for the major assets involved was conducted by an external agency in order to research market values. For nearly 50 percent of the assets repurchase values could be identified, which is difficult because in network industries the requirement of an active market is hardly given. The rest of the assets were re-valued by applying E inflation on the historical net book values and thereby assuming to approximate market values. This led to discussions with the national regulatory agency (NRA) about the acknowledgement of the revaluated asset values and corresponding revaluated depreciation (Ranci, 2005). The revaluation in E-GAAP accounting figures for the asset base created a large gap to the asset base value for group reporting and consolidation which has to be historical net book values according to International Financial Reporting Standards (IFRS) and group reporting guidelines (Pellens *et al.*, 2006). Considering that assets are often 30 to 40 years old illustrates the dimension of this difference. Consequently, this gap in the asset values leads to differences in depreciation and amortization (D&A), which have large impact on earnings in capital intensive industries as the gas industry. As dividends can only be transferred to the shareholders based on E-GAAP statements the revaluation increasing D&A and reducing earnings has led to small profit transfers to the group while the group had to state much larger earnings under IFRS standards. For P this is a clear disadvantage as the Group and shareholders cannot dispose of that money. Consequently this limitation of freedom of action might lead to an additional risk premium. From a regulators point of view these "accounting losses" are likely to be welcomed as they secure money for investments forced to remain in the S companies.

1.2 Regulatory parameters and formulas

The regulatory parameters and formulas used influence the definition of return requirements. As one purpose of regulation, excessive returns, i.e. producer rents above the social welfare optimum, due to the dominant or bottleneck position of a company are capped. Both, rate of return and cost-plus regulation limit the companies returns by setting an allowed rate of return on the capital invested respectively an allowed mark-up on the cost of the goods sold. Incentive regulation based on price-caps sets an allowed return as well but leaves some potential for increasing returns by improving costs more than predetermined by the X-factor. Depending on the length of the regulatory period, the regulatory parameters are at least a short- and mid-term constraint for the company's revenues or margins. And

as, in order to not loose credibility and cause potential underinvestment problems, the regulator is likely to opt for consistent and stable regulation, long-term returns are dependent on current regulatory parameters and formulas as well.

Subject to continuous ex-ante regulation on the monopolistic bottleneck, i.e. the transmission and distribution grid companies are the regional DSOs. With the end of the first regulatory period, regulation for the second regulatory period is valid for 5 years. Distribution network-usage tariffs are regulated on an RPI-X basis (Littlechild, 1983) with an annual revenue cap, i.e. tariffs are set by the regulator after single costs factors determining total revenues have been negotiated with the regulatory object. By means of the revenue cap regulatory method, the regulator sets an upper limit on the revenues of the company. Revenues can be achieved independently from costs. This creates an incentive for the company to reduce costs and improve efficiency.

In E, network-usage tariffs for the DSO business are derived from allowed revenues assuming a planned quantity sold in the upcoming period. In the current regulatory period the allowed revenues are determined by the regulatory formula as presented in Figure 1. The factors are analysed separately. This creates an incentive for the regulated firm to reduce costs, since actual cost reductions can be capture as additional profit.

Figure 1. Schema of the regulatory formula for DSOs in E

The formula is composed of a couple of cost factors, and those who are important for this study are described as follows: (1) RAB x WACC represents, as the NRA states, the allowed profit for the year. This allowed profit is to cover the costs for the entities debt and equity. The RAB (regulated asset base) is a normative asset value analytically set by the NRA. NRA calculated the RAB value with the objective to maintain the gas sectors historical profitability. The following background has to be considered: The revaluation of the DSOs assets led to differences in the asset values stated in IFRS and E-GAAP. NRA is currently not willing to accept the full step-up in the asset base value under E-GAAP and therefore uses a normative value, the RAB, for determining the value of the asset base used for the cost of capital calculation. (2) Allowed depreciation takes into account the D&A of the infrastructure provider. The regulator's aim is to enable the DSOs to replace their assets in the future. The acknowledgement of the revaluated E-GAAP asset base as a basis for depreciation is aimed by S's Regulatory Affairs by the end of the second regulatory period. Some years earlier, negotiations with NRA resulted in a partly acknowledgement of the increased D&A due to the step-up of the assets. (3) Other factors are also included to the formula but due to anonymisation they are not described in this study.

2. Methology

A case study method is applied to explore the dynamics between different variables, e.g. regulation, unbundling, performance requirements and steering (Eisenhardt, 1989; Yin, 2003). Using the case study method the opinions on the different levels of company P and S in different functions (regulatory affairs, management accounting, investment accounting and investor relations) are condensed in order to enrich the ongoing methodological discussion on return requirements, target setting and steering. This proceeding also allows an in-depth view of the companies P respectively S and therefore suits for the explorative approach that characterizes the study at hand. Furthermore the company and management science view on regulation is used to provide findings on how to steer regulated entities in the gas and in other regulated industries.

Conducting the case study, different approaches have been combined: Company data and presentations were provided by P's entities and meetings respectively discussions in an open-ended form (Yin, 2003) with P's employees have provided the general overview on the gas industry and regulation in E. To explore the field of return requirements and the impact of regulation in more detail and to capture (subjective) options on the topic at P three semi-structured interviews have been conducted and transliterated. Those interviews with P's employees, covering mangers of investment accounting, investment relations and financial and economic analysis department and the meetings at S served to get an overview about processes, main issues and the impact of regulation. The results of the interviews are presented in the third chapter.

An Analytic Hierarchy Process (AHP) based on the results of the interviews was used to structure options in a survey like form for the appropriate valuation approach of the investment base and to compare the asset base approaches, capturing the opinions of people involved in steering and target setting at P and S. The AHP is a decision making tool based on pair wise comparisons. It can be used for individual as well as for group decisions (Saaty, 1995). For the central question of the appropriate asset base for return requirements it was used on the one hand to capture the individual decision makers' opinions and on the other hand to compile a ranking of the asset base option among the selected peer group of decision makers. The AHP is advantageous since qualitative and quantitative criteria lead to an overall estimate of the power of each alternative (Saaty, 1995).

A set of criteria has to be defined which contains the relevant factors important for the central question. The first step of the AHP is the pair wise evaluation of both quantitative as well as qualitative criteria against each other. The comparisons are conducted using a scale of the intensity of importance of one criterion compared to another. The scale ranges from 1 to 9 with 1 assigning equal importance to the two criteria in pair wise comparison and 9 assigning absolute importance of one criterion i over the other j. If criterion j was absolutely important over criterion i the reciprocal value of 1 to 9 is used (Saaty, 1995). The second step of the AHP is comparing pair wise the options in terms of their importance to the

fulfilment of the selected qualitative criteria. For the qualitative criteria values need to be collected. The eigenvector method (Saaty, 1995) is applied in a third step to generate a principal eigenvector of the criteria and principal eigenvectors for the options evaluated under each single criterion. The principal eigenvector represents a ranking of the criteria and options with the highest eigenvector value ranking first. For the evaluation of the criteria and the options under the qualitative criteria the original matrix containing the comparisons of the decision maker has to be squared until the difference of the eigenvector of the matrix and its squared counterpart converges to zero and the principal eigenvector is reached. For the qualitative criteria the principal eigenvector can be calculated by the ratio of the single options value divided through the sum of all options values. The described third step exhibits a ranking of the criteria and rankings of the options under each single criterion. In a last step, an overall ranking is calculated by multiplying the criteria eigenvector with the matrix containing the correspondent eigenvectors for the options under each criterion.

For the application of the AHP on the DSOs' asset basis choice for return requirements, decision makers who are considered literate with the asset base options and return requirements were chosen. In order to apply the AHP, a set of criteria had to be selected first; second, the decision makers executed the pair wise comparisons while values for the qualitative criterion had to be determined. Based on that, the individual results were calculated and a group result was generated.

3. Determining return requirements for s' regulated entities

3.1 Description of the current process

Based on the interview data, the current process of determining return requirements for the DSOs can be described as follows. Firstly it demonstrates how return requirements are calculated and defined in practice and secondly has to be considered in the evaluation of the opinions captured in the interviews and the AHP as these might be influenced by the acquainted method.

The parent company P sets targets for the regional DSOs. P determines annual return targets, i.e. requirements, for each entity in the group. Return targets for the single entity are composed of a required rate of return multiplied with a market value of the asset in the single entity. The second component of the return target, the market value of the investment, is in the case of the DSOs calculated with a DCF model. The DCF valuation is based on the annual mid term planning for a 5 years horizon deducted from the regulatory formula and prepared by S. The regulatory formula is therefore used as a principal guidance for the market value and return targets defined by P. Since future cash flows and earnings are based on allowed cost of capital in the regulatory formula, i.e. operating profit before interest and taxes, the DCF investment base result should equal the RAB. In practice additional earnings due to the acknowledgement of a higher percentage step-up in D&A than in asset base for the allowed cost of capital are considered.

Consequently market value in form of a net present value is higher than the RAB. Nevertheless, return requirements are mainly compiled bottom-up rather than top down. A top-down approach would ensure that goals are in line with shareholders' expectations and external benchmarks.

3.2 Determining the appropriate rate of return

Regulation influences systematic risk captured by the covariance of the cash flow distribution with the market portfolio in the CAPM model. Beta factors for regulated business in the gas industry usually are below one, i.e. regulation or the structure of the business lead to a risk factor lower than the risk factor of the market portfolio. Therefore required returns respectively are lower. The term regulatory risk commonly stands for the asymmetric risk, i.e. the risk that the upside potential of cash flows is truncated without any reduction in downside risk (Kolbe *et al.*, 1993). This regulatory risk can either be in the regulatory system ex-ante or emerge ex-post. Ex-ante, before the investment law might contain rules that allow the regulator decides whether an investment made enters the RAB or not. The regulatory concepts in economics do not exactly define which costs are considered in e.g. average costs. Therefore the regulator might as well decide not to acknowledge all cost factors. Ex-post regulatory risk arises due to the sunk costs the regulated firm faces for investments (Pedell, 2006). In the gas industry, i.e. specifically for the regulated grid companies, regulatory risk exists due to the long useful lives of the assets, mainly pipelines and buildings. Regulatory periods are usually about 5 years. While the regulatory parameters are fixed for the running regulatory period based on certain rules, there is uncertainty about the regulators actions and the parameters in the future regulatory periods. The regulated company is thereby facing sunk costs committing the firm to the business while the regulator cannot commit to a certain regulatory strategy (Pedell, 2006).

Asymmetric regulatory risk would increase the required return as an investor wants to be compensated for additional risk. Furthermore asymmetric regulatory risk can cause underinvestment problems. Nevertheless, in general, systematic risk is reduced by regulation. Whether regulation is a factor stabilizing a single business or increasing the risk involved in the investment needs to be assessed individually for the single entity and regulatory regime. While in the past, integrated companies have been the dominant company form in the gas industry, single companies have been established due to legal unbundling in the EU. They still remain part of large utility groups. Consequently market data for regulated grid companies is rarely available. E.g. for P's regulated grid business only five peer companies have been identified in a benchmark study. Furthermore the inter country comparability is limited through different regulatory regimes and other country specific factors. Additionally asymmetric regulatory risk is not measured in the beta factors usually used for company comparisons. Consequently, viable methods to identify a premium for asymmetric regulatory risk need to be identified in further research being out of the scope of this study.

To compare the investment in S' entities with alternative investments available on capital market and evaluate the investment from a shareholders perspective a required rate of return needs to be defined. Currently the required rate of return on equity for regulated grid business at P is determined by an average beta factor of a peer group of five European grid companies and the use of the CAPM model. This peer group approach is generally accepted but nevertheless bearing the problem of the availability of comparable companies and applications issues of the CAPM including the time periods for the beta factor comparison and the choice of the market portfolio (Pedell, 2006).

Two alternative solutions to determine a beta to be used in the CAPM model exist. On the one hand the beta can be calculated by comparing a utility index to the market portfolio by means of an industry beta (Freygang, 1993). Thereby extraordinary events in the development of a set of peer companies are smoothed. However, the problem of appropriately enlivening the beta exists since indices are composed of companies with different capital structures. Since the risks of a regulated entity are dependent on the regulatory regime it faces and since changes in regulation cause structural breaks in terms of the risk of a single entity (Johnstone, 2001) internal analytical methods are an alternative to the presented analogy approaches. Thereby betas are calculated on the entities earnings or other accounting and fundamental figures (Freygang, 1993). Nevertheless this field needs substantial information on the correlation of accounting values and market risk (Freygang, 1993). The application of such methods and questioning their usefulness in the field of regulated industries is a field for further research but is not pursued in this study. As the impact of the choice of the investment base has a higher leverage on the return requirements, this is where this study focuses on.

3.3 Determining the appropriate investment basis

Management science researches commonly use ex-post return measurement concepts, which include a particular valuation of the invested capital. This section examines the choice of an appropriate valuation of the asset base for an absolute return requirement in the case of S' regulated entities. Currently a market value DCF approach based on mid-term planning and the regulatory formula is applied to determine return requirements for the regional DSOs. S' management accounting and corporate development and M&A wanted this approach to be challenged against other concepts and initiated this study to support the ongoing internal discussion on steering and return requirements.

Based on the interviews and internal data provided by the companies, the options for the valuation of the asset base include the past, forecast and benchmark values. An additional option in the case of regulated businesses as the regional DSOs is the normatively set RAB mentioned in the prior sections. The asset base values for the sum of the DSOs under the different valuations approaches were provided by the company and are presented in Table 1.

Table 1. Asset values of the DSOs under the different valuation approaches

Investment/Asset base approach	Value as a percentage of the net book value
Net book values	100,0%
Inflated net book values	203,9%
Regulated asset base	123,8%
Investment book value plus debt	129,6%
Net present value	170,3%
Net repurchase values	263,1%

3.3.1 Selection of the Analytic Hierarchy criteria

The AHP needs a hierarchy of criteria to evaluate the central question of the appropriate investment base for absolute return requirements for the DSOs. The AHP method suggests brainstorming the criteria with other participants (Saaty, 1995). For the investment base AHP, criteria catalogues for well-designed key figures were chosen by the selected group of decision makers as well as relevant criteria added in further brainstorming among the group. Table 3 presents the selected criteria and their descriptions.

Table 2. List of criteria for the AHP on the investment basis

Criterion	Description
a) Qualitative Criteria	
1. Steering	Goal orientated, relevant for internal steering, influence able, non-manipulable, without undesired incentives.
2. Ecnonomic efficiency of surveying	Availability, cost and complexity of elevation, benefit for internal steering, durability.
3. Internal addressee	Understandable, clear-cut, easy to interpret, reliable database.
4. Plausibility	The measure can be considered coherent, appropriate and traceable.
5. Causality	The measure is theoretically linked to determining return requirements.
6. Acceptability by the regulator	The measure is likely to be accepted in negotiations with the regulator (in the regulatory formula).
b) Quantitative Criterion	
7. Actual value of the asset base	The higher the value the better since it impacts allowed annual depreciation and allowed cost of capital.

The first three qualitative criteria, steering, economic efficiency of surveying and internal addressee have been chosen according to KGSt framework (KGSt, 1999). In order not to overload the AHP with too many criteria only the three overall fields of criteria have been selected as criteria for the AHP. The KGSt framework was challenged against two other frameworks, one by UK Treasury and one by Ammons. The group of decision makers involved in the AHP evaluation decided for the KGSt framework but incorporated the sub-criteria of non-manipulability and non-existence of undesired incentives to the steering criterion from the other frameworks for the AHP.

Based on the results of the three interviews, we take plausibility, causality and acceptability by the regulator as additional criteria for the AHP. Plausibility reflects the subjective perception of coherence, appropriateness and traceability of the figure. Causality stands for the theoretically logical or even mathematical logical link of the figure with return requirements. The acceptability by the regulator was added due to the impact of regulation and regulatory authorities on the business.

As a quantitative criterion the actual value of the asset base was selected. This decision was based on the fact that the higher the value of the asset base accepted by the regulator the higher allowed profits and D&A are. This would result in higher earnings for S' entities.

3.3.2 Analytic Hierarchy Process results and findings

After the criteria had been set the decision makers were asked to conduct first, the pair wise comparisons of criteria and second, the pair wise comparison of options under each criterion. Thereby they were not able to monitor the results. Inconsistency was avoided by only undertaking the comparison in one direction while filling out the corresponding field in the matrix with the reciprocal value automatically.

The results of the criteria ranking that were derived from the interviews and the AHP survey are presented in Table 3. Both, individual results and a final ranking for the selected group of decision makers were calculated. On the level of the individual results the principal eigenvectors presented in both figures depict how strong the rankings of the criteria and options for the investment basis differ by stating a percentage weight of the criterion or option. For the overall evaluation the eigenvectors were not weighted since it cannot be assumed that each decision maker uses the given scale from 1 to 9 applying the same logic. Therefore the final ranking of both the criteria and options was established on the average ranking of the criteria or options for the single decision makers.

Table 3. Investment basis - Analytic Hierarchy Process – Ranking of criteria

Final ranking of the criteria	Average & Final Ranking		#1 - S Head of Management Accounting		#2 - S Manger, Investment Accounting		#3 - S Manager, Regulatory Affairs		#4 - S Manager, Corporate Development		#5 - P Manager, Investment Accounting	
	Avg.	Fin.	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
Steering	1,2	1	34,8%	1	30,6%	1	28,0%	1	20,7%	2	30,5%	1
Plausibility	3,2	2	9,3%	5	14,3%	3	17,8%	2	16,2%	4	19,0%	2
Ecnonomic efficiency of surveying	3,6	3	14,6%	3	14,7%	2	16,4%	3	5,7%	6	14,1%	4
Acceptability by the regulator	4,6	4	12,7%	4	13,6%	4	10,2%	6	20,0%	3	8,2%	6
Internal adressee	4,8	5	4,1%	6	7,4%	6	11,2%	4	10,5%	5	14,7%	3
Causality	4,8	5	20,4%	2	12,5%	5	10,4%	5	3,3%	7	11,9%	5
Actual value of the asset base	5,8	7	4,1%	7	7,0%	7	6,0%	7	23,6%	1	1,7%	7

The analysis of the result of the AHP needs to consider the context of the AHP application. The group of decision makers has been selected subjectively as well as the list of criteria to find the appropriate choice of the asset base which might lead to a biased final ranking of the criteria and options. Additionally, for the final ranking it was given equal weight to every decision maker's individual ranking which leads as well to a higher weight of S employees compared to P employees and a higher weight of the management accounting function compared to other functions in the final ranking. Nevertheless with a sample of five decision makers general tendencies can be identified. Furthermore the single decision maker's rankings are analysed separately.

In terms of the criteria relevant for the choice of the investment basis in an absolute return target, the steering criterion was elected the most important with significant distinctness. This result confirmed the expectations of the interviews that saw the major use of the central absolute return target in steering. As the input factor asset base is desired to be selected giving the highest weight to the steering criterion the final return target is going to adhere to the criterion as well. Plausibility is second in the overall evaluation. By the majority of the decision-makers the implicit coherence, appropriateness and traceability of the investment basis is more important than the causality of the figure ranking five. Nevertheless in the case of #1, causality of the investment base is considered more important. This can be explained by the fact that causality due to the theoretical and or mathematical logic link to return requirements usually comes along with plausibility.

The economic efficiency of surveying, i.e. the cost/complexity versus benefit view, is voted third most important overall. Management Accounting (#1, #2, #5) and regulatory affairs (#3) deem this factor more important than corporate development (#4) who is focused on the appropriate measure and increases in absolute return rather than on relative efficiency. Acceptability by the regulator is ranked in the middle of the criteria ranking. It is considered meaningful but the low rankings by the two decision makers (#3, #5) involved in the negotiations with the regulator and in target setting for the regulated entities imply that acceptability is not strongly required. In general, targets need to be well defined and achievable (Weber & Schaeffer, 2008). As the analysis of the

regulatory formula revealed there is additional potential apart from the allowed profits. Setting target at the values accepted by the regulator might therefore even be below the personal goals of the employee resulting in disincentives (Weber & Schaeffer, 2008). The internal addressee criterion is considered less important. Apparently the selected decision makers anticipate few difficulties in terms of the internal perception of the asset base options. The actual value of the asset base is ranked last by 4 of the 5 decision makers. This can be justified by the desire to select an appropriate, coherent and fair option for the investment base by means of the other criteria ranked above. The motivation of #4 to rank the actual value of the asset base first has been driven by the fact that even if other criteria like plausibility need to be fulfilled the one with the highest value should be used for return requirements and steering to incentives maximum profit generation.

Based on the ranking of the criteria, the final ranking was calculated. In other words, the participants did not rank the asset base approaches; they only value the criteria for each approach. Based on this, the final ranking was calculated. Table 4 reveals a clear dominance of the RAB value ranked 1 or 2 by all decision makers even if only medium importance was assigned to the criterion acceptability by the regulator. The RAB is also most likely in line with this criterion since the RAB value is set by the regulator. Consequently the selected decision makers found the RAB on average better fulfilling the other criteria as well. It is a fact that the RAB and the regulator formula determine the revenues of the regulated DSOs. This holds true at least for the current regulatory period. Long-term profits are subject to profound regulatory risk, will be negotiated with the regulatory authorities in talks about the upcoming regulatory periods and finally be set by the regulator. Nevertheless some potential in terms of cost savings and eventually profit shifting to extraordinary result exists. Due to the dependency of short-term profits on the regulatory parameters, the choice of the RAB as the appropriate investment base option (Helm, 2009) for defining return requirements is certainly also motivated by considering the criterion that targets should be achievable and by security thinking of the single decision makers who might not favour ambitious targets. Further support to the use of the RAB is given by analysts also using the RAB as a basic driver for their valuations (Mitchell *et al.*, 2007).

Table 4. Investment basis - Analytic Hierarchy Process – Ranking of asset base approaches

Final ranking of the asset base approaches	Average & Final Ranking		#1 - S Head of Management Accounting		#2 - S Manger, Investment Accounting		#3 - S Manager, Regulatory Affairs		#4 - S Manager, Corporate Development		#5 - P Manager, Investment Accounting	
	Avg.	Fin.	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
Regulated asset base	1,4	1	23,7%	2	21,1%	2	20,7%	1	22,2%	1	30,1%	1
Net present value	3,2	2	11,9%	5	34,7%	1	20,1%	2	10,6%	6	25,7%	2
Net repurchase values	3,6	3	24,1%	1	7,3%	6	9,0%	6	19,4%	2	12,8%	3
Inflated net book values	3,8	4	12,8%	4	13,3%	3	16,0%	4	19,4%	3	10,3%	5
Net book values	4,2	5	18,7%	3	13,3%	4	19,5%	3	13,3%	5	8,8%	6
Investment book value	4,8	6	8,8%	6	10,2%	5	14,6%	5	15,2%	4	12,2%	4

The second, third and fourth ranked solutions are the three market value approaches to the investment base, the net present value, the repurchase values and the inflated net book values. Interestingly either the repurchase or the net present value was ranked advantageous by the decision makers, but #5 ranked both. Considering the calculation procedure of the net present value, which is very much in line with the regulatory allowances, the market value promoters can be split into two groups. The net present value supporters opt for an internal review to determine an asset base, which leads to an absolute return target that can be achieved under the current regulatory conditions and under the assumption that regulatory conditions are not likely to change significantly in the future. The supporters of the repurchase values as the more appropriate choice for the investment base rely on an external benchmark to assign market values to the regulated companies' assets while ensuring that money is earned for the future replacement of these assets. The inflated net book values are considered inferior to the preferred market value approach by each decision maker. This is justified by the questionable assumption on the analogy of general price indices and prices for the assets of the regulated firm.

The two pure book value investment basis options, the net book value and the investment book value plus debt, were ranked lowest. The acquisition cost can serve as a basis to evaluate earnings in the years closely after the acquisition since it represents a market value at the time of acquisition. Even if this market value might have included certain discounts e.g. for insecurity about future regulation, for return requirements actual market values are claimed to be used as the AHP reveals. This can be justified by the fact that, even if in the past excess profits have been earned, this fact is not likely to reduce today's return requirements. A dynamic rather than the mainly static analysis might challenge the question whether these historical excess profits can be considered as sunk costs of the regulator. Determining return requirements on the basis of net book values, with D&A periods of 40 years for pipelines and 50 years for buildings and consequently net book values dating back many years, is ranked inferior as well. First, remuneration on this basis would lead to an under funded state of the company and second, shareholders claims for a return on market values would not be fulfilled leading to a potential disinvestment or the so called underinvestment problem (Helm, 2009).

The underinvestment problem is the most noted problem in regulation of network industries. A frequently named example is the breakdown of Californian electricity supply due to profit shifting and lack of investments (Brand & Scheffran, 2006). The problem emerges if the regulated companies are not allowed to generate sufficient revenues and profits leading them to conclude that investments in the regulated business are not sufficiently profitable any more. Therefore, in the interviews it was mentioned that in the long-run the asset base approach needs to converge with repurchase values.

Conclusions

This study analyses the determination of the asset base and therefore return requirements for regulated entities in the gas industry from the perspective of a company being regulated or holding shares in and/or steering regulated entities. To study the perspective of the company in the regulated industry the case study method was used on S. Meetings and informal talks at S and a series of semi-structured interviews have provided the necessary company background, valuable insights as well as personal opinions on the topic. An Analytic Hierarchy Process was later conducted in order to assess the options for the investment basis used to calculate an absolute return requirement in a structured way. The findings of the interviews were presented in chapter three and enrich the results of the AHP. The general analysis of the European regulatory environment has revealed that while formerly regulation in the single EU countries might have been driven by local governments' preference and benefit maximization especially in the Eastern European countries, common EU regulation has supported a more generalist and standardized approach to regulation. In terms of theory this means fewer concerns about the political failure problem discussed in positive regulatory theory and greater focus on the market failure intervention in normative regulatory theory. Consequently asymmetric regulatory risk is reduced.

From the management science perspective it was shown that P has to question whether a business is worth more combined with the other P's businesses or when being sold to any other investors. This implies that for return requirements market values should be used to state a value for the investment basis in a regulated business. While for the rate of return the use of the CAPM is widely accepted, for the investment basis the case study on the DSOs has revealed that the market value is not necessarily the repurchase value of the assets. Since there is hardly an active market for their assets, the repurchase values might not be considered to be the fair value of the assets of the grid operators. The RAB of the current and the anticipated RAB of future regulatory period used by the regulator to determine network-usage tariffs and allowed revenues is more likely to be a reliable market value since it determines the future cash flows of the regulated entity at least for the duration of the regulatory period. Net present values bear the problem of circularity but from the regulated companies perspective the DCF method is a viable tool to calculate a RAB based market value taking into account the cost of capital determined by the RAB and the allowed rate of return as well as further parameters allowing for additional returns as depreciation and efficiency gains. The approach to derive the valuation from the regulatory parameters is also used by analysts valuating network operators. Nevertheless P assumes that in the long run RAB and the repurchase value of the assets converge. If this was not the case, the network infrastructure would suffer underinvestment problems as companies in the business do not believe to earn appropriate returns on new investments.

These findings in the case of S lead to a twofold view on return requirements for and steering of regulated entities in the gas industry in terms of

the time horizon. Short-term, i.e. during the regulatory period for which conditions have been set, return requirements and steering have to account for the regulatory parameters in order to define achievable targets. Long-term targets need to reflect the necessity to generate sufficient earnings for investments in the replacement of the grid infrastructure. Thereby long-term return requirements can only serve as a figure to control whether regulatory conditions fulfil the needs of shareholders. In order to achieve the approval of repurchase values the return requirement has to be split into single targets such as acknowledgement of cost of capital and depreciation.

Our case study provides a first step, and shall encourage further research on return requirements in regulated industries. However, it has to be recognised, that the specific circumstances of just one considered company narrows the scope of the study. The analysis needs to be performed on additional gas or power companies to increase the sample size and provide more validity. Other limitations arise from the small number of interviews. Last but not least, general limitations of qualitative research have to be considered (Mayring, 2010). It would also be interesting to examine how these subjective opinions match with external views from the NRA. Based on our findings, further research should take this into account as well.

Bibliography

1. **ANDRONICEANU, A.** (2009). "Public policy in the Romanian Energy Sector". *Metalurgia International*, no.11: 194-197.
2. **BRAND, R. & SCHEFFRAN, J.** (2006). *Privatisierung in der Praxis: Der Preis der Deregulierung der Stromerzeugung in Kalifornien [Privatisation in praxis: The price of deregulation of the electricity generation in California]*, In von Weizsäcker, E.U. & Young, O. R. & Finger, M. (eds). *Grenzen der Privatisierung – Wann ist des Guten zu viel? – Bericht an den Club of Rome [Limits of Privatisation: Privatisation - When is it overkill? – Reports to the Club of Rome]*. Stuttgart: Hirzel Verlag: 79-84.
3. **EISENHARDT, K.M.** (1989). "Building Theories from Case Study Research", *Academy of Management Review*, vol. 14, no. 4: 532-550.
4. European Commission, Directorate-General for Energy and Transport (editor) (2005). *Implementing the internal energy market: Annual report 2005*. Luxembourg: The document was available as a print copy and supplied by the EC.
5. European Union (editor) (2006): Consolidated Versions of the Treaty on European Union and of the Treaty establishing the European Community, Official Journal of the European Union, C 321, 29.12.2006, p. E/1 – E/331, URL: http://eurlex.europa.eu/LexUriServ/site/en/oj/2006/ce321/ce32120061229en00010331.pdf, Accessed: 26.06.2007.
6. European Parliament/Council of the European Union (editors) (2003): Directive 2003/55/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in natural gas and repealing Directive 98/30/EC, Official Journal of the European Communities, L 176,

15.07.2003, pp 57-78, (URL:http://eur-lex.europa.eu/LexUriServ/site/en/oj/2003/l_176/l_17620030715en00570078.pdf, Accessed: 01.07.2007).

7. **FREYGANG, W.** (1993). *Kapitalallokation in diversifizierten Unternehmen: Ermittlung divisionaler Eigenkapitalkosten [Allocation of capital in diversified companies: evaluation of divisional equity capital]*. Wiesbaden: DUV – Deutscher Universitäts Verlag.
8. **GROUT, P.A. & JENKINS, A. & ZALEWSKA, A.** (2004). "Privatisation of utilities and the asset value problem", *European Economic Review*, vol. 48: 927-941.
9. **HELM, D.** (2009). *Utility regulation, the RAB and the cost of capital.* Oxford: Oxford University Press
10. **JOHNSTONE, D.** (2001). *Asset Valuation and Regulation of Energy Infrastructure Tariffs in Australia: The Use and Deficiencies of DORC.*
11. **KOLBE, A.L. & TYE, W.B. & MYERS, S.C.** (1993). *Regulatory Risk: Economic Principles and Applications to Natural Gas Pipelines and Other Industries.* Boston/Dordrecht/London: Mass: Kluwer Academic Publishers.
12. **KGSt** - Kommunale Gemeinschaftsstelle für Verwaltungsmanagement (1999). *Ziele finden, Zahlen kennen, Handeln können [Defining goals and knowing data to start].* Cologne.
13. **LITTLECHILD, S.** (1983). *Regulation of British Telecommunications profitability.*
14. **MAYRING, P** (2010): *Qualitative Inhaltsanalyse: Grundlagen und Techniken [Qualitative content analysis: Basics and Techniques]*, 11th ed. Berlin:Beltz.
15. **MITCHELL, V. & KHANNA, A. & JAIN, P.** (2007). *HSBC Global Research: Multi Utilities: Equity – United Kingdom: National Grid: Company Report, May 2007.*
16. **PEDELL, B.** (2006). *Regulatory Risk and the Cost of Capital: Determinants and Implications for Rate Regulation.* Berlin/Heidelberg/New York: Springer.
17. **PELLENS, B. & FÜLBIER, R.U. & GASSEN, J.** (2006). *Internationale Rechnungslegung: IFRS 1 bis 7, IAS 1 bis 41, IFRIC-Interpretationen, Standardentwürfe: Mit Beispielen, Aufgaben und Fallstudie [International Accounting: IFRS 1 to 7, IAS 1 to 41, IFRIC-Interpretations, Standard-concepts: With examples, tasks and case study]*. 6th ed. Stuttgart: Schäffer Poeschel Verlag.
18. **RANCI, P.** (2005). *Applying a Price Cap: RAB and Regulatory Accounting*. In W. Rothengatter & G. Ragazzi (eds). *Procurement and financing of motorways in Europe*. Amsterdam: Elsevier: 55-66.
19. **SAATY, T.L.** (1995). *Decision Making for Leaders: The Analytic Hierarchy Process for Decisions in a Complex World*. 3rd ed. Pittsburgh: RWS Publications.
20. **STERN, J. P.** (1998). *Competition and Liberalization in European Gas Markets – A Diversity of Models.* London: The Royal Institute of International Affairs.
21. **Von KEITZ, I.** (2005). *Praxis der IASB-Rechnungslegung [Pracitce of ISAB-Accounting]*. 2nd ed. Stuttgart: Schäffer Poeschel Verlag.
22. **WEBER, J. & SCHAEFFER, U.** (2008). *Einführung in das Controlling [Introduction to Controlling]*. 12th ed. Stuttgart: Schäffer Poeschel Verlag.
23. **YIN, R.K.** (2003). *Case Study Research: Design and Methods*. 3rd ed. Thousand Oaks, California/London/New Delhi: Sage Publications.