INCENTIVES AND OBSTACLES OF IMPLEMENTING EFFICIENCY BENCHMARKING IN ECONOMIC REGULATION

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ABSTRACT

In this paper, the role of the efficiency benchmarking in the economic regulation of the distribution business is discussed. The benefits and barriers of implementing efficiency benchmarking are studied based on theoretical analysis and practical examples. In these analyses, it is shown what are the effects of benchmarking in the profitability of the network investments. Based on the analysis, the most critical aspects of the implementation of the efficiency benchmarking are presented.

INTRODUCTION

Electricity distribution companies operate in the state of the natural monopoly and, therefore, they do not have pressure from the open markets for high service quality or reasonable pricing. To prevent the misuse of the monopoly position, the economic regulation of these companies is needed. Among the quality and price issue, also the lack of the efficiency incentives is seen as one of the disadvantages of the monopoly position. Hence, the aim of the economic regulation of the monopoly companies is not only to prevent the misuse of the monopoly position, but also to provide companies with efficiency incentives. In many cases, efficiency benchmarking is used in order to include such incentives in economic regulation.

In this paper, the effects of the efficiency benchmarking for the distribution companies are considered. In the first section, the role of the efficiency benchmarking in the economic regulation is considered. That includes the reasons for using the efficiency benchmarking, as well as the three parts of the benchmarking process; input data, benchmarking methodology and the implementation of the benchmarking to the economic regulation. Second section deals with the directing effects of the benchmarking, which includes the theoretical analysing of the directing effects, as well as the practical example of the effect of the benchmarking to the profitability of the network investment. Conclusions are made in the section three.

EFFICIENCY BENCHMARKING IN THE ECONOMIC REGULATION

Economic regulation can be seen as the instrument that balances the controversial expectations of the stakeholders; that is, the customers' expectations on reasonable prices and the owners' expectations on adequate returns on their investments. Another essential goal of regulation is give incentives for efficiency improvements within the monopoly sector. The implementation of the efficiency benchmarking is often the primary means by which the benefits of the efficiency improvements are distributed among customers and owners.

When considering efficiency benchmarking as a part of economic regulation, the following issues are of high relevance: 1) determining whether efficiency benchmarking should be included in the economic regulation; 2) the parameters chosen for the benchmarking purposes and the quality of the applied data; 3) the characteristics of the benchmarking method itself; and 4) the implementation of results in regulatory calculations.

Need for efficiency benchmarking

Generally, there are three basic reasons behind the using of the efficiency benchmarking in the economic regulation. At first, due to the asymmetry of the information regulator does not know the appropriate level of the costs of the companies. Thereby regulator benefits from the using of the efficiency benchmarking, since he or she can find the appropriate cost levels of the companies by comparing them against each other by the means of the efficiency benchmarking. Secondly, efficiency benchmarking can be used to put up a pseudo competition between the distribution companies, since such companies do not face normal competition due to their natural monopoly position. Third, and in many cases most important reason for using of the benchmarking is to provide companies with efficiency incentives and in the other hand to ensure that both, customers and distribution company benefit from the efficiency gains.

Beside of the regulatory usage, benchmarking can also be used to find out the best practices in the industry. In that kind of approach, different cost items of the companies, e.g. metering costs, fault repair costs, etc., can be compared and by that way it can be found out, what are the duties that can be improved the most. Obviously, the nature of the benchmarking is highly different in the regulatory usage than in the comparison of the best practices of the companies. However, the problem in this approach is the lack of the appropriate input data. In order to compare exact cost items of the companies, the categorizing of the costs should be similar in each company. Overhead costs, for

example, are usually problematic, since booking practices can differ greatly from company to another.

Input data

One critical aspect in the design of the benchmarking model is the defining of the input parameters, since the metering of one parameter itself directs companies to improve that parameter.

However, when considering the input data of the benchmarking, the important issue is not only choosing the parameters, but also the quality of the input data, since data is used to compare the companies against each other. Thereby poor data quality of one company could affect the results of all the other companies. Therefore, benchmarking cannot be implemented if the data quality is not high enough. In practice, this means that the gathering of the data should be commenced several years before the results of the benchmarking can be implemented in the economic regulation.

Benchmarking method

There are several criteria for the economic regulation model; such that, it should be acceptable, predictable, unbiased, dynamic, simple, and understandable. When efficiency benchmarking is a part of the regulatory model, the same criteria focus on the benchmarking model also. However, some of these criteria are exclusionary to each other. For instance, several environmental parameters should be included in the efficiency benchmarking model, if one wants that the results are acceptable. However, that kind of model is not simple anymore. Thereby it should be accepted that not all the criteria can be fulfilled simultaneously, but the model is always a compromise.

When considering the benchmarking model, one interesting question is an assumption of the returns to scale made in the benchmarking model. The inefficiency of the small and/or large companies that may be due to the scale of the operation can be compensated in the benchmarking model. In that kind of approach returns to scale assumption is not constant, but it varies depending on the size of the company. However, if the return to scale assumption is not constant, the model is no longer unbiased, but it favours big and/or small companies.

Implementation of the results in the regulation

When we consider the four steps of the efficiency benchmarking; decision of the using the benchmarking, defining the input data, choosing the benchmarking method, and implementing of the results to the economic regulation, the first three issues are those that determine the parameters that should be improved and how the improvements affect efficiency score. However, the last one, implementation of the results in the regulation, is the most important when we consider the economical effects of the efficiency benchmarking. This part determines how the company specific efficiency targets are derived from the result of the efficiency benchmarking. That includes the magnitude of the efficiency target, cost components, on which the efficiency target is focused on, as well as time that is given for distribution company to achieve the desired efficiency level. This part of the benchmarking process determines also how the efficiency gains are divided between the company and customer.

DIRECTING EFFECTS OF THE EFFICIENCY BENCHMARKING

When considering the directing effects of the efficiency benchmarking, it should be noticed that benchmarking is only one part of the regulatory framework. Thereby the directing effects of the efficiency benchmarking are dependent not only on the properties of the benchmarking, but also the role of the benchmarking in the economic regulation.

Efficiency benchmarking as a part of the whole regulatory system should provide companies with incentives to minimise their total costs. These total costs should include costs of the distribution company, i.e. operational and capital costs, as well as costs incurred by the customers due to the interruptions. Thereby the minimum of the total costs is achieved by the optimal power quality level, as shown in figure 1.

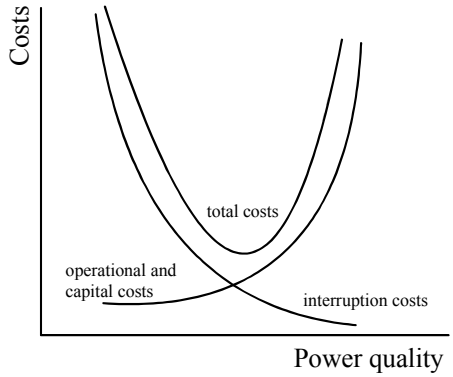

Fig 1. Total costs relative to the power quality level.

However, the optimal level of the power quality is company specific; for instance, if company operating in the rural area strives for the power quality level typical for the urban areas, total costs are most likely not minimised. Thereby, standard limits of the power quality cannot be assessed for the companies. Instead, it is more suitable to introduce the regulatory model, which provides companies with incentives to strive for the minimal level of the total costs.

Example of the directing effects

The effects of the efficiency benchmarking on the return of the investment are illustrated here by analysing the effects of the example network investment for example distribution company. The initial data of the example distribution company is shown in the table 1.

Table 1. Initial data of the example distribution company.

Annual operational expenses (OPEX)	5 000 k€/a
Repurchase value of the distribution network	120 M€
Depreciation time of the distribution network	40 a
Annual straight-line depreciations	3 000 k€/a
Average annual investment costs	3 000 k€/a
Average annual interruption costs	700 k€/a

In the example, distribution company decides to replace a part of the overhead-line network with underground cables. It is assumed that the age of the replaced overhead-line network is equal to the depreciation time of the network; in the other words, the present value of that part of the network is zero. Relevant data of the example investment is shown in the table 2.

Table 2. Example network investment.

Investment cost	5 000 k€
Depreciation time	40 a
Straight-line depreciation of the investment	125 k€/a
Effect on the annual operational expenses	-50 k€
Effect on the annual interruption costs	-100 k€

Regulatory model, used in these analyses is illustrated in the figure 2. Regulatory model is based on the rate-of-return regulation; return of capital is based on the present value of the network assets and weighted average cost of capital (WACC) –percent. In the following calculations, the value of the 4,65 % is used for the WACC. Depreciations, used in the determination of the allowed revenue, are straight-line depreciations, based on the repurchase value and depreciation time of the distribution network. Efficiency requirement is based on the results of the efficiency benchmarking and it is focused on the sum of the operational costs and depreciations.

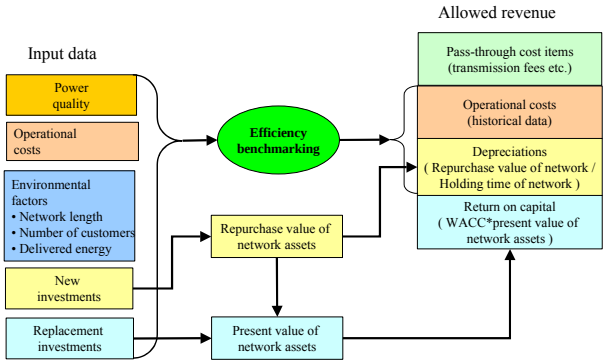

Fig. 2. Regulatory model used in this example.

Three alternatives for the efficiency benchmarking are studied in this example.

Case 1: No efficiency benchmarking

In this case, it is assumed that there is no efficiency benchmarking included in the economic regulation. Otherwise regulatory model is similar to one described in the figure 2.

Due to the absence of the efficiency benchmarking, the improvement of the power quality does not affect allowed revenue of the company in this case. The decrease of the operational costs, on the other hand, improves the actual profit of the company in the short term. However, if the allowed operational cost is based on the operational costs of the company from previous years, it can be assumed that the reduction of the operational costs reduces also the allowed revenue in the future. Thereby the only issue that affect on the allowed revenue of the company is change in the value of the network assets. Thereby change in the allowed revenue can be calculated with the equation (1).

$$\Delta\text{Revenue} = \text{Investment cost} * \text{WACC} + \frac{\text{investment cost}}{\text{depreciation time}} \quad (1)$$

The increase of the allowed revenue is in this case 358 k€/a.

Case 2: Investment costs in the efficiency benchmarking

In this case, the input parameter of the efficiency benchmarking is the sum of the operational costs, investment costs, and interruption costs. The sliding average of the 5 years data is used for the investment costs. It is assumed that efficiency score is directly relative to the changes in the input parameter. Original input parameter of the benchmarking is 8 700 k€ (5000 k€ + 3000 k€ + 700 k€). Input parameter after the example investment is:

$$5000\text{k€} - 50\text{k€} + 3000\text{k€} + \frac{5000\text{k€}}{5} + 700\text{k€} - 100\text{k€} = 9550\text{k€}$$

Thereby the change in the efficiency score is:

$$1 - \frac{9550}{8700} * 100\% = -9{,}8\%$$

In this case, it is assumed that efficiency requirement is derived directly from the efficiency score. Thereby the decrease in the allowed revenue of the company, that is due to the decrease of the efficiency score is:

$$\Delta\text{Revenue} = -9{,}8\% * (3000 + 5000 + 700)\text{k€} = -853\text{k€}$$

However, at same time allowed revenue is increased by 358 k€ due to the increase in the value of the network assets. Thereby total decrease in the allowed revenue is 495 k€.

Case 3: Depreciations in the efficiency benchmarking

In this case, the input parameter of the efficiency benchmarking is the sum of the operational costs, straight-line depreciations, and interruption costs. Thereby the original input parameter is 8700 k€ and it decreases due to the example investment by the value of 25 k€ (+125 k€ -50 k€ -100 k€). Thereby the change in the efficiency score due to the example investment in this case is:

$$1 - \frac{8675}{8700} * 100\% = +0{,}3\%$$

Change in the revenue, due to the change in the efficiency score is:

$$\Delta\text{Revenue} = 0{,}3\% * (3000 + 5000 + 700)\text{k€} = +26\text{k€}$$

In addition, allowed revenue is also increased due to the increase in the value of the network assets. Thereby the total increase in the allowed revenue is 384 k€.

Findings of the example

Changes in the allowed revenue due to the example investment in different benchmarking alternatives are compiled to table 3.

Table 3. Change in the allowed revenue of the distribution company due to the example investment.

Case 1: No efficiency benchmarking	+358 k€/a
Case 2: Investment costs in the benchmarking	-495 k€/a
Case 3: Depreciations in the benchmarking	+384 k€/a

As can be seen from the table 3, input parameters of the efficiency benchmarking have significant effect on the profitability of the network investment.

Differences between case 2 and case 3 are in the modelling of the investments; in the case 2 investments are included in the benchmarking as investment costs, while straight-line depreciations are used in the case 3. Depreciations are based on the existing network, and thereby they reflect more the need of the annual investments than actual investment costs. On the other hand, using of the actual investment costs could reduce significantly the profitability of the investments and by that way, it could prevent some of the needed network investments. This kind of directing effect is clearly seen in this example; allowed revenue will decrease due to the investment in the case 2 where actual investment costs are included in the efficiency benchmarking. If investments have strong effect on the efficiency of the company, companies might adopt an idea to increase their efficiency by neglecting the network investments. With this kind of strategy, companies can achieve short-term efficiency gains, since the negative effects of the neglecting the investments, i.e. reduced power quality, will realise after few years delay.

CONCLUSIONS

Based on the analysis of the economical effects of the example investment, it is shown that efficiency benchmarking can be used to provide companies with incentives for the investments that improve the power quality and decrease the total costs. However, the same analyse prove that the choosing of the input parameters have significant effect for the profitability of the investment. Therefore, poorly designed efficiency benchmarking can be a barrier for the network investment and it can increase the regulatory risks, faced by distribution companies.

One critical issue in the designing of the regulatory model and efficiency benchmarking is the role of the power quality. If the efficiency incentives included in the economic regulation are strong, it should be assured that companies do not reduce their costs by neglecting the power quality issues. In the other words, this means that efficiency benchmarking cannot be included in the economic regulation without concurrent power quality regulation.

When considering the efficiency benchmarking, used in the economic regulation of the electricity distribution companies, three critical issues can be found. At first, input parameters and the quality of the input data are highly relevant. The quality of the data is especially important, since companies are compared against each other, and thereby poor data quality could reflect to the results of every company. Second issue is the benchmarking model, which should fulfil the same demands that are focused on the whole regulatory system. Last, but not least is the implementation of the results of the efficiency benchmarking to the economic regulation. This last issue is the one that determines actual economical effects of the benchmarking. Thereby incentives provided by the economic regulation, as well as possible regulatory risk, faced by distribution companies, are clearly dependent on it. In general, the effects of the benchmarking should correspond with the general planning criteria of the electricity distribution companies. That is, to give incentives to minimise the total costs of the network operations. However, it depends on the implementation of the benchmarking, whether it provides companies with true efficiency incentives. If the implementation is poorly designed, efficiency benchmarking can also cause instability to the business environment and increase the regulatory risks faced by the companies.