INCENTIVE BASED REGULATION OF THE FINNISH DSOS – EXPERIENCES OF THE FINNISH REGULATOR

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ABSTRACT

Incentives are an important part of a well functioning regulation scheme. When the Finnish Energy Market Authority developed the regulation model for the DSOs for the regulatory period 2008 – 2010, specific incentives were included in the model already from the beginning of the planning process. This paper describes what kind of incentives related to cost of capital, operational costs and outages the Finnish electricity network regulation model provides for the DSOs.

INTRODUCTION

Because electricity network operation is a monopoly business without any threat from competition, the distribution system operators do not receive many natural incentives to improve their efficiency and the quality of their network services. Therefore the regulators have an important role to correspond to the missing competition and provide incentives to the network operators to improve efficiency and quality of their operations.

The present EU legislation requires that the electricity network operators shall be supervised and regulated in all member states. However, the regulation has not been applied exactly in the same way in every country. As a matter of fact, even though the basic principles are similar and the purpose of the network regulation is the same in every country, the practical details vary between countries. This paper shows the basis of the Finnish regulation scheme and regulation model applied and concentrates more detailed in describing the incentives in the regulation model. Development of the regulation is always a long task and the regulator has to take into consideration also national characteristics of the distribution sector. This paper will give some information of the choices made in Finland about the regulation model of the electricity distribution.

The Finnish electricity market legislation requires that the pricing of network services shall be reasonable. At the preamble to the Bill, it has been stated that the pricing of electricity network services should give reasonable return on invested capital and cover the costs of efficient operation. The Electricity Market Authority (since year 2000 the Energy Market Authority) is responsible in Finland for supervising that the network system operators provide their network services to the customers according to the criterion set in the legislation.

Principles of regulatory supervision in Finland

Before year 2005, the supervision of electricity network operators in Finland, was based on an ex-post regulation in which the regulator investigated the reasonableness of electricity network pricing case-by-case. This caused also some problems for the market actors because the regulator was not able to confirm any binding principles regarding to the pricing regulation in advance.

When the internal electricity market directive (2003/54/EC) was introduced, the regulation model in Finland was changed into ex-ante regulation. The new regulation model came into force at the beginning of year 2005. The regulation model is based on the regulatory periods of 3-4 years. The first regulatory period was applied in 2005 – 2007 and the present regulatory period started at the beginning of 2008 and will cease by the end of 2010. Before each regulatory period, the regulator confirms with its decision the methodology of reasonable pricing of network services for the whole regulatory period.

The confirmed methodology might include following items: (1) Valuation principles of capital bound to the system operations; (2) Method of determining the approved return on the capital bound to the system operations; (3) Methods of determining the result of the system operations and the correction of the income statement and balance sheet required by them; (4) Target encouraging improvement of the efficiency of the system operations and the method of determining it, as well as the method to apply a target in pricing; (5) The method of determining the pricing structure, if the method of determination is necessary for providing access to the system or to implement an international obligation binding on Finland or if the method of determination is related to pricing of services under the systems responsibility.

After the regulatory period, the regulator supervises that each DSO has followed the confirmed methodology and confirm per each DSO how much profit they have been able to collect during the period and how much profit they have actually collected. If the DSO has collected more profit that has been allowed according to the methodology, the
regulator will oblige the operator to refund this windfall profit to the customers with lower network charges during the next regulatory period. On the other hand, if the DSO has not taken as much profit as allowed, the regulator allows the operator to increase the network charges during the next period to collect the difference.

INCENTIVES AS PART OF THE REGULATION MODEL

When there exists free competition, market will operate in the most efficient way and operating in the market equilibrium point, market will generate the maximum value for the social surplus (=consumer surplus + producer surplus). Parkin [1] explained that a monopoly exists, for example, if there is only one operator in the line of business whose operation is protected by preventing the competitors to enter the market. Compared to the free competition situation, the profit maximizing monopoly will manipulate the market in a way that consumer surplus will get smaller and the producer (monopoly) surplus will become bigger. The size of a social surplus will also diminish and bring rise to allocative inefficiency and so called dead weight loss. In brief, the economic theory claims that monopoly is not as good for the society as free competition would be.

Joskow [2] stated that so called natural monopoly occurs when it is more economic for one operator to take care of the business (providing service or produce goods) than to allow two or more operators to involve. This is exactly the case in the electricity distribution.

Even if we have to accept the existence of a natural monopoly it does not mean that we have to tolerate the negative affects that it has (such as inefficiency, excess pricing, and restriction of services or goods). Usually the society favours the existence of a natural monopoly when it discovers that it is the best alternative at that situation. However, the society can also regulate the operation of this natural monopoly and this way prevents its negative effects becoming too big. In a case of electricity distribution, the society usually regulates (in a way or another) pricing and the quality of distribution. This is also the case in Finland.

The ultimate purpose of the regulation of the natural monopoly is to diminish the efficiency loss caused by the monopoly. The dissertation of Viljainen [3] explained this idea so that the most important goal of liberalising electricity market has been to guide previously monopoly business into competition and thus create an incentive for it to lower costs and make operation more efficient (this has happened in electricity production and in electricity sales). However, electricity distribution is still a natural monopoly, so efficient network operation and reasonable pricing should be guaranteed through regulation.

Development of a balanced regulation model for electricity distribution is not a simple task. One of the basic problems related in regulation is the information asymmetry. Typically regulator has less information on the realised cost of network operations and thus also of pricing of services than regulated company itself. Naturally, regulated company tries to exploit this situation and tries to sustain it by not giving voluntarily any extra information to the regulator. According to Honkapuro dissertation [4], one way to understand and tackle the information asymmetry problem is to use principal-agent arrangement in where regulator is seen as a principal and the regulated companies are seen as the agents.

Regulatory authority has a number of possibilities to make the asymmetry of information smaller. A widely used method for making the negative effects of the information asymmetry smaller is to use incentives. They are usually part of the regulation model and the idea is simply to make it profitable for the regulated company to reveal the real cost of network operations and the potential to improve its efficiency.

Joskow [5] describes incentive regulation as a mechanism to provide powerful incentives to regulated companies to reduce costs and improve the quality of services in a cost effective manner. Incentives need to stimulate introduction of new products and network services, efficient investments and pricing of access to regulated network services. According to Joskow, the performance of the regulated DSOs can have significant effects to the competitive electricity sectors as the DSOs provide the infrastructure platform for them to run their business.

When setting incentives to regulation model, regulatory authority may include incentives for the regulated companies to perform in a certain way, for example to increase efficiency, it is possible that in trying to meet this target the company may neglect some other important network operation. In setting multiple incentives regulator has to be careful to set incentives in such a way that they are in balance and that no individual incentive is dominant related to others.

A MORE DETAILED DESCRIPTION OF THE INCENTIVES IN THE FINNISH REGULATION MODEL

One of the main objectives of the Finnish distribution network regulation has been to provide adequate incentives to the DSOs to minimize the total costs of network operations (TOTEX). The regulation model is based on an idea to look at the costs of the distribution network operation from the customers’ point of view. Thus the TOTEX has three components: capital costs (CAPEX), operational costs (OPEX) and outage costs (OUTAGE). The customers will gain the maximum social welfare when
the sum of these costs is at the minimum level.

\[ \text{Min } \sum_{i=1}^{T} (C_{\text{capital}} + C_{\text{operational}} + C_{\text{outage}}) \]

It should be noted also that these cost items have influences between each other. Therefore, minimizing one cost item might lead to increase in another item. Thus reaching the minimum level at the capital or operational costs might not lead to the optimal situation for the customer.

The capital and operational costs are real costs for the network operators and thus the DSOs have own interest to minimize these cost items. The outage costs, meaning costs related to disutility of interruptions, are such costs that are not included in the financial statement of the DSO.

**Incentives related to the cost of capital invested in the network operations**

The distribution network regulation model includes incentives to the DSOs to make investments to the network, but the regulatory model provides reward for the investments which also minimize TOTEX.

In the regulatory model the value of regulated asset base (RAB) plays a vital role and the main share of RAB is the value of electricity network. In the Finnish regulatory model the book value of electricity network is replaced with the net-present value of the network (NPV). At the evaluation process of the NPV regulator uses standard replacement costs for the network components. The NPV is evaluated annually by taking into account both materialized investments (INV) and depreciations calculated from the replacement value of the network (DEP):

\[ NPV_i = \sum_{t=2}^{n} (NPV_{t-1} + INV_{t-1} - DEP_{t-1}) \]

This model has both penalty and rewarding factors. The model gives strong incentives to the DSOs to make enough investments to the network, because all investments are taken into account in calculating the NPV and thus at least the reasonable profit for the investment is guaranteed. The DSO may gain extra profit if investment also decreases OPEX or outage costs. On the other hand, if the DSO neglects necessary investments, the NPV will start to decrease and the allowed profit from the network operations will be lower.

**Incentives related to the operational costs**

The Finnish regulatory model requires that DSOs shall improve their efficiency and the regulator’s task is to approve the costs of efficient operation. To motivate DSOs to improve their efficiency, the model includes efficiency targets set for each DSO. These targets are aimed only to operational costs.

All DSOs have common efficiency requirement, which means that each DSO has to improve efficiency at least as much as the most efficient DSOs have improved their productivity in 2003-2005. During 2008 – 2010 this common efficiency target requires that DSOs shall decrease their OPEX in real terms 2.06 per cent per annum.

There are differences between DSOs on how efficiently they are in the network operations. Therefore the regulation model includes also company specific efficiency targets. The regulator has used both the DEA-model (Data Envelopment Analysis) and the SFA-model (Stochastic Frontier Analysis) to benchmark DSOs. In both models the TOTEX has been used as an input parameter and thus the results show how much each DSO shall decrease TOTEX to reach the efficient frontier. However, the company specific targets, based on the benchmarking results, are placed on only to the OPEX.

**Incentives related to the outage costs**

The aim of the incentives related to outage costs is to motivate DSOs to maintain and improve good quality of the delivered electricity and not only to try to generate as much profit as possible for the owners.

The description of the functioning of incentives related to the outage costs is presented also by Kinnunen [6]. The purpose of this reference is not only to describe the function of one individual incentive but also to give some ideas in how the incentives operate together.

In the regulation model, the incentives related to the outages are included as the outage costs and as the OPEX. The outage costs describe the economic losses of outages for the customers (disutility of outages). The aggregated value of the outage costs in Finland in past three years has been over 100 million euro per annum.

In the Finnish regulatory model many types of outages are included in the outage costs. Table 1 presents the prices for different types of outages which have been applied in the regulation model.

**Table 1.** Prices for different types of outages used in the regulation model (in the value of money of 2005) [7].

<table>
<thead>
<tr>
<th>Type of Interruption</th>
<th>Price ( \text{€/kW} )</th>
<th>Price ( \text{€/kWh} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexpected interruption</td>
<td>1.1</td>
<td>11.0</td>
</tr>
<tr>
<td>Planned interruption</td>
<td>0.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Short auto reclosing</td>
<td>0.55</td>
<td>1.1</td>
</tr>
<tr>
<td>Long auto reclosing</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The quality incentive applied in Finland could be characterized as a capped penalty and reward system. In other words, penalty or reward is, at a certain limit, dependent on the performance of the DSO. Even if the
outage costs, meaning costs related to disutility of interruptions, are not included in the financial statement of the DSO, in the regulation model they however affect directly to the allowed profit of the DSO. If the actual outage costs of the DSO overrun the reference level based on the historical data of outage costs of that DSO, the regulation model decreases allowed profit of the DSO. On the other hand, if the DSO has been able to improve the quality of electricity distribution and to reach the level of outage costs below the reference level, the DSO is allowed to gain extra profit.

The idea is that the mechanism provides incentive to the DSO to improve its own previous performance. To gain win-win situation between the DSOs and the customers the quality of electricity distribution and to reach the level of outage costs below the reference level, the DSO is allowed to gain extra profit.

The Finnish network regulation model includes also a special mechanism for very long interruptions. If an interruption has continued at least for 12 hours, the DSO has to pay a standard compensation to the customer. In the economic regulation model these payments are included in the OPEX and thus have influence on realised profit of the DSO.

The idea of the quality incentive applied in Finland is shown in Figure 1.

![Figure 1](image)

**Figure 1.** The incentive related to the outage costs in the Finnish regulation model [6].

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CONCLUSIONS

The Finnish electricity network regulation model provides relevant steering signals for the DSOs to decrease the total costs of the network operations. The regulator has tried to set incentives so that the steering signals will motivate the DSOs to operate in a desired and acceptable way. Changes in network operations take time and the effects of the regulation are visible just after several years.

Even if the present regulatory model includes incentives to ensure the reasonable distribution tariffs along with the sufficiently reliable distribution network services, further development of the regulatory model is still needed. The next challenge for the regulator lies with the objectives to keep the regulatory model fairly simple and at the same time to take into account all relevant substantial factors that have influence on the distribution network operations in the future. To meet this challenge the Energy Market Authority has started to prepare a strategy for the development of the network regulation until year 2020.

REFERENCES


