Estonian Experience in Implementation of Incentive Type of Price Regulation

Märt Ots
Estonian Competition Authority
6 Auna St, 10317 Tallinn, Estonia
mart.ots@konkurentsiamet.ee

Arvi Hamburg
Faculty of Power Engineering
Tallinn University of Technology
5 Ehitajate Road, 19086 Tallinn, Estonia
arvi.hamburg@ttu.ee

Einari Kisel
World Energy Council
5th floor, 62-64 Cornhill, London
EC3V 3NH, United Kingdom
kisel@worldenergy.org

Tarmo Mere
Elektrilevi OÜ,
63 Kadaka Road, 12915 Tallinn, Estonia
tarmo.mere@elektrilevi.ee

***Abstract*—Administrative resources of the regulatory body and the number of regulated utilities is an important criteria in selection of price regulation methodology. Estonian experience is based on a large number of relatively small utilities. The price regulation methodology implemented is incentive type of Rate of Return where the important element is the regulatory deterrence, where the company can select whether to apply for new tariff or to rely on the existing one. The administrative burden is minimized in this case. The results of price regulation indicate significant savings on energy losses and stable service tariffs.**

Keywords—economics, power distribution, power system management, power system reliability.

I. INTRODUCTION

The first objective of the price regulation is sustainability - the regulated company must be able to finance its operations and make any required investment, so that the company can continue operating in the future [1]. From customers' perspective, high quality of the service provided and minimum price are the expectations. From shareholders' point of view reasonable rate of return on invested capital shall be guaranteed. Theoretically, it is possible to reach a theoretical maximum of the quality by building double or triple power lines or gas pipes, exceeding the n-1 criteria. However, one must agree that these type of technical solutions are only theoretical. Depending on the legislation of the specific jurisdiction, the task of the regulator is to select or to assist in selection of the regulatory methodology which corresponds to the main objective of price regulation. The summary of different regulatory objectives indicates, that the main criterion for selecting of regulatory methodology is to reach the maximum efficiency where the customers´ and the companies´ interests are in balance.

The regulatory methods can be divided to two main categories: ex-ante and ex-post [2]. By using of ex-ante regulation, the prices are fixed by the regulator. By using of ex-post regulation, the prices or fees are applied by the company without any coordination by the regulator and the regulator may control later whether these prices or fees meet the criteria set by the legislation. At present, the Natural Gas Act in Estonia has applied such a regulation, whereby the market dominant gas company must base its prices on the costs and earn justified return of the investment made [3]. A similar regulation is applied in the district heating sector in Finland and Sweden, where the companies apply prices designed by themselves and the regulator has the right to control their justification [4]**.** The same type of ex-post price control is implemented by the Competition regulation. According to the article 102 of the Treaty on the Functioning of the European Union the abuse of the dominant position by imposing of unfair selling prices is prohibited [5]. The same type of principles are established in Estonian national Competition Act [6]. In Estonia there are several practices by implementation of the Competition Act in cases of abuse of the market dominating position by unfair pricing [7], [8].

The ex-ante methods can be divided in three main categories:

- Rate of return (RoR);
- Price cap
- Long Run Incremental Costs Bottom UP (LRAIC).

According to different sources the above mentioned regulatory methods have different definitions. The price cap is defined as incentive type of regulation and named as retail price index minus x (RPI-x) in a number of sources [1], [9]-[11].

The RoR and RPI-x are more or less based on existing network installations and to the historical costs associated to the operation of those existing assets. In contrast to RoR or RPI-x the LRAIC model is based on hypothetical system [2]**,** [12]. By using LRAIC the only data corresponding to the existing situation are the demand, capacity and geographical location of the existing customers. It means that the basic approach of those methods is totally different, as provided in Table 1.

TABLE 1. PROFIT ELEMENTS COVERED BY ALTERNATIVE REGULATORY REGIMES

Regulatory System	Covered by Regulation	Ignored by Regulation
Price cap	P	Q, C_x, C_n
Price cap with cost pass-through	P, C_x	Q, C_n
Revenue cap	P, Q	C_x, C_n
Rate of return	P, Q, C_x, C_n	-

Furthermore, each method can have different subdivisions, depending on which economical risks are left to be handled by the company. From companies point of view, the profit is the main result of the regulation [11]. The profit is dependent on different inputs as described in equation (1).

$$R = PQ - C_x(Q) - C_n(Q) \quad (1)$$

where

- R - company's profit
- P - price
- Q - sales volume
- C_x - exogenic or uncontrollable costs
- C_n - endogenic or controllable costs

The profit covered by classic type of RPI and RoR is described in Table 1 [11]. In a simplified approach, the classic type of RPI-x seems to be the most desirable, due the fact that it is more oriented to the efficiency gains, where the RoR seems to cover all risks related to the regulation. In practice, the regulatory methods are hybrids, containing elements from different alternative methods.

Another issue is the administrative cost of economic regulation. In the case of a small number of large size utilities it is efficient to apply an advanced and costly regulatory system. It pays off due to the fact that the efficiency for the society is higher than the resources spent on regulation. Another issue is the large number of small utilities, as is the situation of regulated sectors in Estonia.

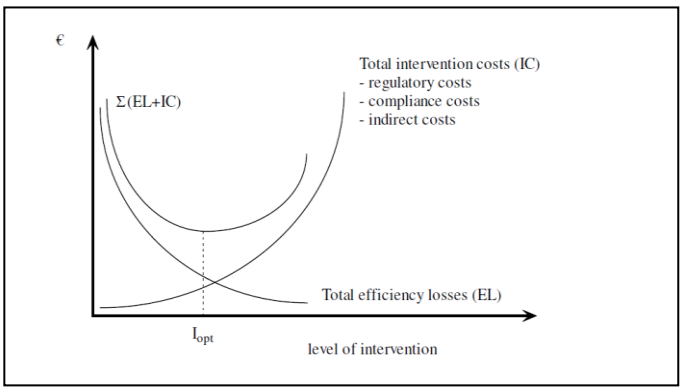

Fig 1. Optimal level of welfare loss control.

The effect of economic regulation on the level of whole society is analysed by Hertog [13], [14]. It is important to find the optimal level of intervention by the regulator. Beyond an optimal point, the additional resources spent on regulation will give no additional effect, but in contrast to desired result will be an additional burden for the society. The core of this basic framework is captured in the diagram on Fig 1.

II. ESTONIAN CASE OF REGULATION OF LARGE NUMBER SMALL SIZE UTILITIES

In the case of large number of small utilities, the cost of regulation shall be especially considered by selecting of regulatory methodology. In Estonia the number of utilities regulated by the regulatory body – Estonian Competition Authority (ECA) - is 260. This includes energy and water utilities [15]-[21]. The annual turnover of the smallest companies may not exceed 50 000 €. It can be assumed that by applying of economic regulation, it is possible to save 5% for the society. From this perspective it is reasonable to apply the regulation which annual costs are not exceeding 2,500 €. The 2016 annual budget of ECA is 1.8 m€, with the proportion of 60% (i.e 1.1 m€) for the regulatory activities [22]. In addition to the energy and water regulation the budget for regulatory activities includes the regulation of postal, railway and airport sectors [23]. If all resources available for regulatory activities would be spent for price regulation of energy and water utilities, the budget per utility would be 4 231 € per annum. In practice this amount is much lower due to the fact that besides the price regulation the regulatory body is responsible for a number of tasks, like EU co-operation, surveillance of electricity and gas markets, solving of customers complaints, etc. However, it is clear that within this budget is impossible to introduce advanced type of RPI-x regulation. From utilities point of view, the administrative burden by selecting of regulatory methodology shall be considered. If a large utility is on higher or at least on equal level with regulator to present data or to have discussions, a small utility suffers lack of resources for that. Beside direct administrative costs, also indirect costs related to the regulation exist, like the cost of capital. The level of regulatory risk is included to the cost of capital [12]. This shall be also considered by selecting of regulatory methodology.

The RoR implemented in Estonia includes a number of elements from RPI-x, where various risks shall be covered by companies. There is a 15 years of experience of using this methodology in economic regulation of energy and water utilities in Estonia [24]. One of the main principles in using this methodology is the companies right to present the application to fix the new tariff on any time. Companies are obliged to monitor the cost base, in case the tariff is not covering all costs, the company can apply for a tariff increase. This moment occurs for example where the sales volume has declined, uncontrollable costs like fuel or electricity have increased or the cost of capital has changed. For implementation of new tariffs the regulator´s approval is needed. This can be a time-consuming process with administrative burden, especially for small-size utilities.

Referring to Table 1, by using of classical type of RoR method, the controllable costs are covered by the regulation [11]. That is the case where the company carefully monitors costs and the tariffs are actually fixed by the regulator in accordance to the basis of the historical costs of the company. The method used in Estonia differs a lot from the classical type of RoR where the costs included to the tariffs in principle differ

from the company´s historical cost base and the regulator is actively demanding implementation of cost saving measures: reducing energy losses, saving on operational costs, etc. By using of so called "incentive type of RoR", controllable costs are not covered by the regulation.

To reach the energy conservation target, the obligation to reduce the power losses has been set to the utilities [25], [26]. The reason of obligation was the extremely high power losses in distribution companies up to 20% by starting the price regulation in the beginning of 2000s. The fulfilment of the obligation is company´s risk, similar to the efficiency target x used by RPI-x regulation. The company can maximise the return on capital by saving more than established by the regulator. In an opposite case, the difference shall be paid from the company´s return.

By using classic type of RoR, the risk of sales volume is covered by the regulation [11]. Based on forecasted sales volume, the weighted average of last three years is used as a rule in Estonian price regulation. If there are significant changes in customer structure, the detailed analyses are prepared [26]. By using the weighted average consistently, it is possible to eliminate this risk. Special situation may emerge in case of constantly declining sales volumes, like in district heating sector in Estonia, where the sales is declining due to the demographic situation and energy efficiency measures implemented by the customers. In this case, the sales volume is a clear risk for companies. In order to address cases like this, an under/over recovery system similar to revenue cap could be used [27]. This type of system was used in energy regulation in Estonia until 2012. In order to decrease the administrative burden, the under/over recovery is not used anymore. This is clear evidence, that the risk on sales volume is not automatically covered by the regulation.

By using the classical type of RoR the risk of uncontrollable costs is covered by the regulation as well [11]. Despite the companies right to turn to the regulator by applying for a new tariff, this type of risk exists. The cost pass-through principle combined with cost under/over recovery should be used for full coverage of the risk of uncontrollable costs. If the company is earning more or less than expected return due to the changes in uncontrollable costs, this will be over- or under-recovered by fixing the tariffs [1], [27]. For example, if the electricity cost for compensation of losses of a power DSO is more than expected, it will be compensated to the company during the next regulatory period. Or *vice versa*, if the electricity price is cheaper than expected, this amount will be paid back to the customers during the next regulatory period. This type of scheme was used in Estonian price regulation but is abolished now in order to simplify the price regulation. Similarly to the sales volume, the risk on uncontrollable cost is not automatically covered by the regulation.

All in all, the general target of Estonian price regulation has been to ignore the risk on controllable cost, but to cover the risk on sales volume and uncontrollable costs. The risks on sales volume and on uncontrollable costs shall be covered by the company, by presenting of tariff application to the regulator.

The regulatory model introduced in Estonia can be characterised as having set up the goal to save on administrative costs of the regulatory body. There is no requirement for systematic data collection, the historical data and prognosis are prepared only by applying of new tariff. This system can be defined as some kind of regulatory deterrence where the company knows that applying of tariffs will rise notably heavy administrative burden. This is motivation system to rely on existing tariffs and not to turn to the regulator for fixing new tariffs.

III. Analysis of Results of Implementation of Incentive Type RoR Price Regulation Method

The main results of 15 years price regulation in Estonia are the efficiency gains in energy savings and the fact that the companies' actual return is mostly equal or below the WACC set by the regulator. The prices in real terms have been almost stable or even declining [15]. The outcome clearly indicates that the incentive type of RoR implemented in Estonia does not guarantee the required return which is one of the main characteristics of the classic type of RoR. On Fig 2 the average return on invested capital of the largest Estonian power utilities is presented.

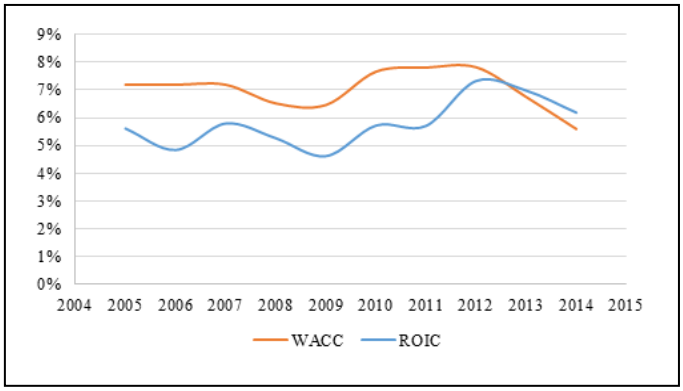

Fig 2. Average Return on invested capital of power networks incl. Elering, Elektrilevi, Imatra, and VKG.

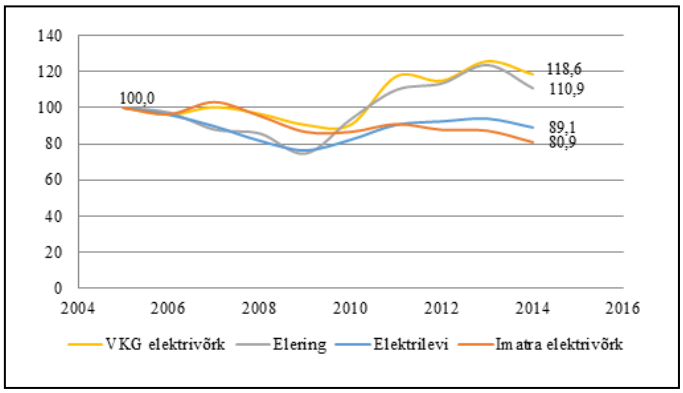

Fig 3. Relative change of tariffs of the largest power networks in real terms. The tariff in 2005 is 100 units.

The main target of RPI-x regulation is the decline of tariffs in real terms, this is included to the price formula as a negative value of the x-factor. By using of RoR, the price development in line with inflation could be expected. The analyses of power networks indicate that the tariffs have been stable or declining

in real terms (Fig 3). The tariffs of Elering (TSO) have been increased by 11% (Fig 4). The main reason of tariff increase is the intensive investment program carried out by building international links whereby the regulatory asset base (RAB) of the company has increased 1.55 times. Without building of those international links, the tariffs would have been decreased from 100% to 83% in real terms. [15].

The reduction of electricity losses in power distribution networks is a success story of Estonian price regulation. 15 years ago, before the start of economic regulation, the power losses of 20% were commonly observed. Today the losses are close to the technical minimum where the further reduction is not much possible. The reduction of electricity losses of 3 largest DSO's with summary market share of 93% is presented on Fig 5 [28], [15].

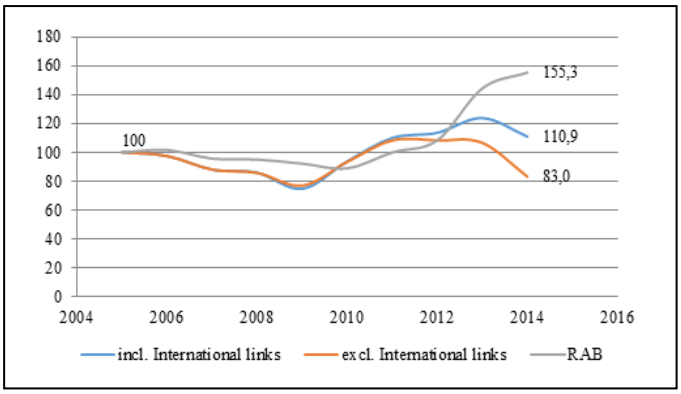

Fig 4. Relative change of tariffs and RAB of Elering in real terms. The tariff in 2005 is 100 units.

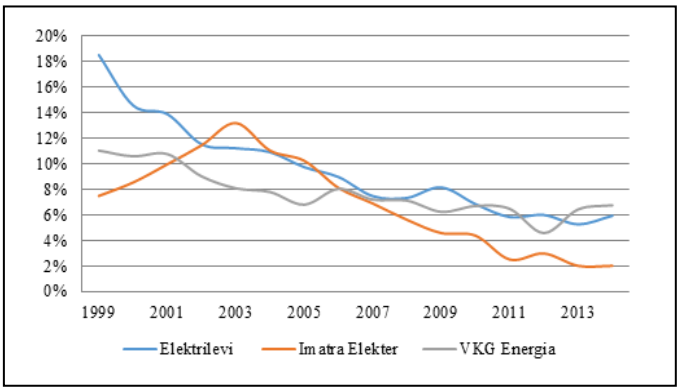

Fig 5. Electricity losses of distribution operators in percentages.

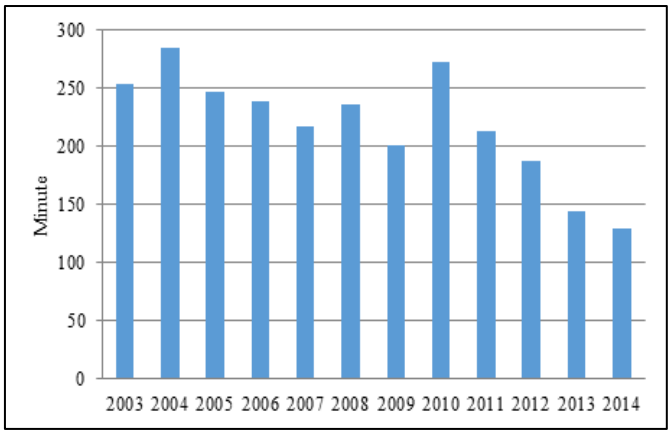

Fig 6. Changes in network reliability indicator SAIDI in Elektrilevi OÜ

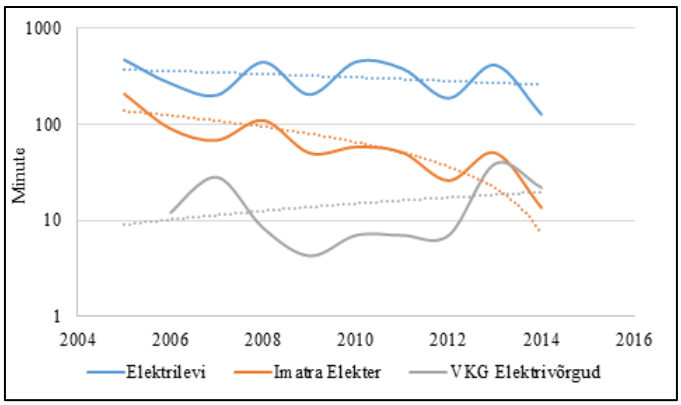

Fig 7. Changes in network quality indicator SAIDI in largest DSO's on the logarithmic scale.

Fig 6 presents the changes of the System Average Interruption Duration Index (SAIDI) of the largest power DSO Elektrilevi OÜ from 2003 to 2014. SAIDI indicates the average outage duration for each customer served. The calculations of SAIDI on Fig 6 do not take into account the impact of occasional weather impacts [2]. The calculations of SAIDI of three largest power DSO's is presented on Fig 7, this includes the impact of weather as well [15]. The conclusion is that the network reliability indicators have been improved during this period.

IV. CONCLUSION

The aim of the paper was to analyse the impact of the price regulation methods in the case of a large number of small size utilities with restricted administrative resources of the regulatory body. The "incentive type of RoR" model has been implemented in Estonia, where the regulator is inventively regulating the company's costs, including the energy efficiency. The results of the price regulation indicate that the tariffs have been declining in real terms and significant energy savings have been reached.

The conclusion is that the incentive type of RoR has the biggest impact on company's operational costs. The clear indicator is the reduction of energy losses, where the regulator

is pushing the company toward of efficiency in operating costs. The similar indicator is the actual return on capital that has been mostly below the allowed return by the regulator. This is indicating that a part of the operational costs, not included to the tariff by the regulator is financed from company's return. This fact is also indicating, that the RoR implemented in Estonia is not a classical one, where the allowed return is guaranteed to the company. The fact that the tariffs are declining in real terms is indicating some relation to the RPI-x, which is indicating, that the incentive type of RoR implemented in Estonia has some elements of RPI-x. The "incentive type of RoR" is suitable by regulating a large number of small utilities with limited administrative resources where the effect of regulatory deterrence is motivating the utilities to manage within the budgets set by the regulator.

V. REFERENCES

[1] R. Green and M. R. Pardina, Resetting Price Controls for Privatized Utilities. A Manual for Regulators. Washington, D.C: The World Bank, 1999.

[2] M. Ots, A. Hamburg, T. Mere, T. Hõbejõgi and E. Kisel, "Impact of price regulation methodology on the managerial decisions of the electricity DSO," IEEE Energycon 2016, Leuven, in press.

[3] Natural Gas Act, Riigi Teataja I, 12.07.2014, vol. 73. Tallinn, 2015.

[4] V. Lukosevicius and L. Werring, Regulatory Implications of District Heating, Budapest: ERRA, 2011.

[5] Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union, Official Journal of the European Union, Luxembourg, 2010.

[6] Competition Act, Riigi Teataja I, 30.12.2014, vol. 15, Tallinn, 2014.

[7] Decision of Estonian Competition Authority (Konkurentsiameti otsus) 30.12.2014 nr 5.1-5/14-036, 2014. [Online]. Available: http://www.konkurentsiamet.ee/public/Otsused/2014/o2014_036.pdf; http://www.konkurentsiamet.ee/public/Otsused/2014/Otsuse_lisa__G4S_kohustus.pdf.

[8] Decision of Estonian Competition Authority (Konkurentsiameti otsus) 11.07.2013. 5.1-5/13-028, Konkurentsiamet, Tallinn, 2013.

[9] J. S. Netz, Price Regulation: theory and perfomance; Regulation and Economics, R. J. Van den Bergh and A. M. Pacces, Eds., Chetlenham, Northampton: Edward Elgar, 2012.

[10] C. Gibson, C. McKean and H. Piffaut, Regulation of water and wastewater, R. J. Van den Bergh and A. M. Pacces, Eds., Cheltenham, Northampton: Edward Elgar, 2012.

[11] I. Alexander, C. Mayer and H. Weeds, Regulatory Structure and Risk and Infrastructure Firms, Washington DC: The World Bank, 1996.

[12] B. Pedell, Regulatory Risk and the Cost of Capital, Springer, 2006.

[13] J. Hertog, Review of Economic Theories of Regulation, Utrecht, Utrecht School of Economics Utrecht University, 2010.

[14] J. den Hertog, Economic theories of regulation, Regulation and Economics, R. J. Van den Bergh and A. M. Pacces, Eds., Cheltenham, Northampton: Edward Elgar, 2012.

[15] Results of Price Regulation in Estonia (Hinnaregulatsiooni tulemuste hindamine reguleeritud sektorites), Konkurentsiamet, Tallinn, 2015.

[16] Water Tariffs Approved by the Estonian Competition Authority (Konkurentsiametiga kooskolastatud veeteenuste hinnad), Konkurentsiamet, Tallinn, 2016.

[17] The Rationality of Price Regulation of Small Size District Heating Utilities (Riikliku regulatsiooni otstarbekusest väikestes kaugkütte võrgupiirkondades), Konkurentsiamet, Tallinn, 2013.

[18] Power Network Companies on Estonian Electricity Market (Jaotusvõrguettevõtjad elektriturul), Konkurentsiamet, Tallinn, 2016.

[19] Gas Network Companies on Estonian Gas Market (Võrguettevõtjad gaasiturul), Konkurentsiamet, Tallinn, 2016.

[20] Heat Generation Tariffs Approved by the Estonian Competition Authority (Konkurentsiametiga kooskõlastatud soojuse tootmise piirhinnad), Konkurentsiamet, Tallinn, 2016.

[21] District Heating Tariffs Approved by the Estonian Competition Authority (Konkurentsiametiga kooskõlastatud soojuse piirhinnad), Konkurentsiamet, Tallinn, 2016.

[22] Act on State Budget of 2016, Riigi Teataja I, 23.12.2015, vol. 6, Tallinn, 2016.

[23] Annual report of Estonian Competition Authority 2014, Konkurentsiamet, Tallinn, 2015.

[24] O. K. Uukkivi, "Systematic approach to economic regulation of network infrastructure sectors in Estonia," Tallinn: TRAMES 18(68/63), vol. 3, 2014, pp. 221–241.

[25] Electricity Market Act, Riigi Teataja I, 30.06.2015, vol. 43, Tallinn, 2015.

[26] Price Regulation Methodology for Power Networks (Elektrienergia võrgutasude arvutamise ühtne metoodika), Konkurentsiamet, 2013.

[27] M. Ots, Implementation of price regulation of energy utilities in Estonia. Master thesis. (Energiaettevõtete regulatsioon ja selle rakendamise võimalused Eestis. Magistritöö), Tallinn: Tallinna Tehnikaülikool, 2002.

[28] Estonian Electricity and Gas Market Report, Konkurentsiamet, Tallinn, 2014.

.