Efficient regulation – precondition for electricity market development

Eraldo Banovac
Croatian Energy Regulatory Agency
Zagreb, Croatia

Darko Pavlović
Plinacro Ltd.
Zagreb, Croatia

Dalibor Pudić
Croatian Energy Regulatory Agency
Zagreb, Croatia

Igor Kuzle
Faculty of Electrical Engineering and Computing,
University of Zagreb, Zagreb, Croatia

***Abstract*—A well-defined energy policy is a precondition for the successful development of any country. The European Union set the general objectives of national regulatory authorities. National regulatory authorities fulfill significant tasks in the Member States with respect to the creation of a fully operational internal market in electricity. Social regulation, Rate-of-return and RPI-X regulation are described in the paper. Special attention is paid to the mathematical basis of the RPI-X regulation and the weighted average cost of capital, which regulatory authorities use to ensure that returns are equal to the opportunity cost of capital.**

Keywords—electricity market; energy policy; regulation; weighted average cost of capital

I. INTRODUCTION

Breaking monopolies and opening the electricity market impact national economies. During the last twenty years, the Europen Union (EU) has set its energy policy with three energy packages [1-3]. Furthermore, the European Commission presented the legislative proposal "Clean Energy for all Europeans" (so-called Winter Package) on 30 November 2016. The Winter Package pursues three main goals: putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers. The Winter Package covers measures relating to energy efficiency, renewables, electricity market design, security of supply and governance rules for the Energy Union [4]. The Winter Package also tackles energy poverty.

The EU assigned important obligations to the regulatory authorities (regulators), which carry out regulation in Member States, targeting the creation of a fully operational internal electricity market. According to the EU rules, Member States guarantee the independence of regulators and ensure that they exercise regulatory power transparently.

The concept of energy regulation was first established in the United States about a hundred years ago [5]. In the context of energy policy, an efficient regulation is of the utmost importance for the development of utilities and the electricity market. Moreover, appropriate regulation can contribute to a more productive society. Therefore, monitoring of energy activities still remains an important duty of regulators [6].

A lack of regulation in electricity market occurs when:

- there is no efficient regulatory regime to secure competition and supply of electricity at the most competitive price,
- market players are not encouraged to reduce costs (they may transfer all their costs to the customers despite the fact that they are not consistent with the expenses incurred in purchasing electricity and in supplying electricity to the customers),
- market players are not obliged to provide sufficient information to consumers, which are necessary for making reasonable choices,
- there are no adequate measures to promote a more efficient use of electricity for which a secure supply is a precondition,
- there are significant externalities not covered by those who imposed them, but paid by a society as a whole (for example, an older energy plant creates some external costs to the environment arising from its process – and pollution is considered as an externality because it imposes costs on those who are not involved in any way in the operation of such a plant).

When considering regulation in this paper the following is presumed: an appropriate regulatory framework, which encompasses a set of laws, sub-laws and methods with rules essential for a well-functioning electricity market. Decreasing the costs of regulated utilities by improving business efficiency, supporting the security of energy supply and protecting the environment are also included in the main goals. Such a regulation, which is carried out by the entitled regulators, requires the use of a range of efficient regulatory methods and techniques, a sufficient regulatory budget and a competent staff. In the EU, a Member State guarantees that the regulator carries out its duties impartially.

II. THE EXTENT OF REGULATION

The extent of regulation depends on the legislative framework and the regulation methods used by regulators. The main regulation methods are:

- Social regulation,

- Rate-of-return,
- RPI-X regulation.

A. Social Regulation

Social regulation is oriented to global social interest. It encompasses:

- standards that serve as benchmarks,
- consumer protection,
- rules that govern expected behavior,
- environment protection by eliminating undesired external impacts such as land, water or air pollution,
- protection of resources,
- effects of social innovation.

Social regulation may result in significant benefits for the consumers. Nevertheless, this regulation may not meet goals in an effective manner and it is difficult to predict the effects of social innovation. Furthermore, some techniques of social regulation can be oriented towards externalities. Externalities are such external effects that occur when the production or consumption of a certain company influences the costs or benefits of other companies in the surroundings. Such a phenomenon is not included in the calculation. Therefore, it is ignored by producers and buyers. The consequence is that externalities have no direct reflection on market prices.

According to [7], "economic and social regulation are coming together through the influence of challenges such as climate change".

B. Rate-of-Return

Rate-of-return (RoR) or cost plus method was widespread in the United States in the early 20th century. RoR is based on a simple principle: monopolies have to charge the price that would ideally prevail in a competitive market. The price is defined in relation to the costs of efficient production, plus a market-determined rate of return on capital. Therefore, an important question in RoR is: what profit may investors receive?

By implementing RoR, the regulators allow utilities only those costs that are necessary to ensure the quality of services given to consumers. The regulators evaluate the acceptable rate of return on capital, by which utilities realize appropriate profits. Nevertheless, RoR was not accepted in Europe due to the following disadvantages:

- there is little incentive to reduce costs significantly,
- there is little incentive to increase efficiency,
- collecting a huge number of data from utilities is a costly process, which demands considerable bureaucratic structure,
- regulators do not collect complete information comparable to those that utilities really have.

To avoid the aforementioned problems, a new method of regulation was applied in the United Kingdom in the 1980s. This method is based on the price cap principle implemented during a regulatory period. Depending on specific circumstances, the regulators choose a longer regulatory period to ensure transparency, stability and predictability of the implemented regulatory regime.

C. RPI-X Regulation

Reform of the electricity sector involves moving away from RoR towards the implementation of incentive-based regulation. Different models of incentive regulation are described in literature, as in [8-10].

Incentive regulation is widely implemented in many natural monopoly industries. If utilities identify cost savings, they may earn a higher return and *vice versa*.

Regulators determine prices or revenues that are valid in the defined regulatory periods. Regulators use the principle of defining incentives for regulated utilities to act more efficiently, i.e. it aims to lower costs, improve quality of services and rational distribution of risks and costs.

Incentive regulation includes methods and techniques for determining prices or revenues used by regulators to realize specific aims. Substantial infrastructure investments are needed to contribute to market integration as well as for security of supply. Investors must be protected from the negative influence of bad decisions, such as when an underestimated rate of return on capital was set. Therefore, protection of investors is a challenging target of regulation in the electricity sector.

The regulators are also obliged to promote measures for consumer protection. Besides supporting consumers' rights, an adequate consumer protection also facilitates efficient functioning of the electricity market. Generally speaking, consumers must be efficiently protected from monopolies because electric utilities often have strong market power. In fact, electric utilities have a potential to exercise power as a natural monopoly because electricity networks belong to a group of strategic infrastructures. The role of regulators is to balance the aforementioned targets.

Price cap regulation developed in the United Kingdom is related to price, competition, security of supply, quality of supply, quality of services, investments and consumer protection, but it is characterized by a dominant orientation to prices.

Price cap regulation is also known as RPI-X regulation (RPI – Retail Price Index minus the X-factor – productivity factor). The Price cap regulation is an important method of incentive regulation. By implementing Price cap regulation, the regulators prescribe the X-factor value in a particular case. The RPI is a measure of inflation that measures the change in the cost of a representative sample of retail goods and services. The productivity factor value generally reflects the aim of the productivity increase in carrying out an energy activity. It should be emphasized that regulators incentivize productivity increase using the productivity factor, which also means decreasing the costs of business.

The RPI-X regulation is widely applied in the EU to regulate energy activities in electricity and natural gas, telecommunications and water industry.

At this point, it should be pointed out that the electric-power industry is characterized by a complex structure. Besides the issue of capital financing costs, a planning approach, selection of maintenance strategy and engagement of considerable resources are required to ensure safe functioning of such a system [11-12]. Therefore, regulators implement more and more complex methods, thus trying to achieve productivity improvement [13].

III. Mathematical Basis of the RPI-X Regulation

Using the Price cap regulation, regulators define:

- the maximum limit of price, or
- the average price value.

Regarding the use of Price cap regulation in the electricity sector, defining the maximum price is common in regulatory practice – in such a way that electricity price per kWh enables utilities to earn an appropriate profit. The price is kept realistic by indexing it according to inflation of retail prices, along with an increase in productivity.

Following the USA theoretical model, the base price equation can be written as follows:

$$Price_{(t)} \leq Price_{(t-1)}(1 + I - X) + Z \qquad (1)$$

In (1) the parameters are:

- $Price_{(t)}$ – maximum price of electricity defined for a certain category of consumers in the current year t,
- $Price_{(t-1)}$ – average price of electricity defined for the same category of consumers in the previous year,
- I – inflation index,
- X – productivity factor,
- Z – increase of costs on which utilities cannot influence (e.g. accounting, tax, legislative or regulatory changes not reflected in the measure of inflation).

It is possible to expand (1) by including infrastructure investment's factor (in cases of lump sum investments) and quality of supply adjustment factor. Furthermore, the inflation index can be replaced by any index which is publicly available and which is independent of the regulator's influence (the Consumer Price Index – CPI, the Producer Price Index – PPI, the Gross Domestic Product Price Index – GDP Price Index, etc.).

Equation (1) is a modification of the British basic price-cap model:

$$P_{(t+1)} = P_{(t)} + RPI - X \qquad (2)$$

In (2) the parameters are:

- t – starting year of the regulatory period,
- t+1 – next year of the regulatory period,
- $P_{(t)}$ – price in the starting year t,
- $P_{(t+1)}$ – price in the next year t+1,
- RPI – changes in the cost of a fixed basket of goods,
- X – productivity factor.

The next price cap equation, aimed to define the maximum electricity price for year t+1, is:

$$\max P_{(t+1)} = \max P_{(t)}(1 + I_{(t+1)} - X_{(t+1)}) \pm CF_{(t+1)} \qquad (3)$$

In (3) the parameters are:

- $\max P_{(t+1)}$ – maximum electricity price in year t+1,
- $\max P_{(t)}$ – maximum electricity price in year t,
- $I_{(t+1)}$ – inflation index (the annual change in prices),
- $X_{(t+1)}$ – productivity factor defined for year t+1,
- $CF_{(t+1)}$ – capital additions' adjustment factor for year t+1.

To advance the quality and efficiency of regulation, more complex Price caps have been developed over time. If there are n tariff categories, which each consists of m components, the Price cap assumes the following form:

$$\sum_{i=1}^{n}\sum_{j=1}^{m} Price_{(ij)}^{t+1} \cdot Q_{(ij)}^{N} \leq (1 + CPI - X)\sum_{i=1}^{n}\sum_{j=1}^{m} Price_{(ij)}^{t} \cdot Q_{(ij)}^{B} \qquad (4)$$

Besides the complexity of such a basket of prices (tariffs), it is simple to express that (4) follows a clear RPI-X form, i.e.:

$$(1 + CPI - X) \geq \frac{\sum_{i=1}^{n}\sum_{j=1}^{m} Price_{(ij)}^{t+1} \cdot Q_{(ij)}^{N}}{\sum_{i=1}^{n}\sum_{j=1}^{m} Price_{(ij)}^{t} \cdot Q_{(ij)}^{B}} \qquad (5)$$

In (5) the parameters are:

- $Price_{(ij)}^{t}$ – defined price for the current year t for the component j of the tariff i,
- $Price_{(ij)}^{t+1}$ – proposed price for the component j of the tariff i for year t+1,
- $Q_{(ij)}^{N}, Q_{(ij)}^{B}$ – prediction or quantification of the component j of the tariff i which will be used for the monitoring of prices,
- N – predictive values for the next year,
- B – implemented values in the previous year,
- CPI – recorded changes in the cost of a fixed basket of goods,
- X – productivity factor.

It is also important to mention that CPI differs according to inflation (for example, CPI of 0.01 means that inflation is 1%).

Revenue cap regulation is another model of RPI-X regulation. Using this type of regulation, regulators define the annual revenues allowed to be achieved by utilities. Revenue cap regulation is often easier to determine than price cap, but may lead to distorted prices.

Target revenue for the current year t, in the case of an electricity distribution utility, can be defined as follows:

$$R_{(t)} = TR_{(t)}(1 + CPI - X) + \Delta R_{(t-1)}(1 + IR_{(t)}) \qquad (6)$$

In (6) the parameters are:

- $TR_{(t)}$ – total estimated costs for the current year t,
- CPI – measure of inflation – the Consumer Price Index,
- X – productivity factor set by the regulator (where, for example, 0.005 means that targeted costs' decrease is 0.5%),
- $\Delta R_{(t\text{-}1)}$ – amount of revenue for which the electricity distribution utility had the right to charge, but did not charge in year t-1 (there is a negative number when the amount of revenue in year t-1 was charged by the utility, but the utility wasn't entitled to charge it),
- $IR_{(t)}$ – interest rate defined by the regulator to ensure that the additional revenue amount paid by consumers in year t equals to the amount of revenue for which the utility was entitled to charge but did not charge in year t-1.

Nowadays, the EU is facing energy challenge. The Winter Package implicates a new electricity market design relating to the rules for the future Energy Union. Regarding distribution of electricity, the networks become more active with an increased share of electricity generation from renewable energy sources, solar energy systems, CHP schemes and heat pumps, etc. Therefore, modeling future regulation, including issues of impact on demand and profiles, could be a challenging task.

Besides the different forms of price or revenue cap equations, it is possible to use the combined (hybrid) revenue and price caps in regulatory practice. The basic hybrid price cap equation takes the following form:

$$P_{(t)} = (1-\xi)\cdot f(P_{(t-1)}) + \xi \cdot \left(\frac{R_{(t)}}{S_{(t)}}\right) \qquad (7)$$

In (7) the parameters are:

- $P_{(t)}$ – price in year t,
- $f(P_{(t\text{-}1)})$ – price cap component,
- $R_{(t)}$ – revenue in year t,
- $S_{(t)}$ – sales in year t,
- ξ – relative weighting of price cap and revenue cap components.

Furthermore, the basic hybrid revenue cap equation takes the following form:

$$R_{(t)} = (1-\xi)P_{(t)}S_{(t)} + \xi \cdot f(R_{(t-1)}) \qquad (8)$$

In (8) the parameters are:

- $R_{(t)}$ – revenue in year t,
- $R_{(t\text{-}1)}$ – revenue in year t-1,
- $f(R_{(t\text{-}1)})$ – revenue cap component,
- $S_{(t)}$ – sales in year t,
- ξ – relative weighting of price cap and revenue cap components.

It is possible to use different values of ξ to create multiple combined revenue-price cap equations. The regulators define the value of ξ in the interval [0,1]. This means that $\xi = 0$, when the considered mathematical forms turn into the Price cap form and $\xi = 1$, when they turn into the Revenue-cap.

At this point, it should be emphasized that RPI-X regulation with incentive mechanisms for improving efficiency of business is the most frequently used in regulatory practice.

IV. Productivity Factor

Regulators use the productivity factor (X-factor) to adjust the initial level of allowed revenues taking into consideration that the X-factor represents productivity gains. Using X-factors, regulators encourage regulated utilities to operate more efficiently and to lower prices over the defined regulatory period. This is possible due to the reduction of operating costs. If the realized productivity is greater than the projected productivity, the regulated utility will achieve a higher yield rate than planned.

Setting the X-factor is often a regulatory challenge. Using an appropriate benchmark method is the best way to conduct efficiency analysis related to setting X-factors. The regulator should consider and select the benchmark method to set the X-factor correctly, knowing that methods differ from the data they collect as well as from the mathematical model used for data processing. Regardless of the selected benchmark method, the regulator must take into account the cost levels of the benchmarked utility against comparable utilities.

From a regulatory point of view, an efficient benchmark method provides equal conditions for determining the business performance of regulated utilities. In Europe, the United Kingdom, Norway and the Netherlands were the first to use utility benchmarking to set X-factors.

Apart from the problem of selecting an appropriate benchmark method, the following regulatory tasks are assigned to the regulator when setting the X-factor:

- analyzing the possibilities for increasing the productivity of the regulated utilities,
- accurate estimation of changes in input prices (for example, the prices of energy fuel that usually strongly affect operating costs of the regulated utilities),
- forecast of the expected changes in assets of the regulated utilities.

Using benchmarking, a regulated utility gains insight in all aspects of the business and can take measures aimed to increase efficiency. In addition, the regulator makes decisions regarding data quality, data collection procedures and reporting methods. Furthermore, using benchmarking, the regulator identifies which utility is the most efficient in the sector and the relative relationships of the business performance of other comparable utilities. Based on the relative efficiency, X-factors are assigned to the utilities.

In the case of an electricity sector with a limited number of utilities, conducting cross-country efficiency analysis enables setting the X-factor properly. Including the utilities that represent the best practice is an advantage of conducting a cross-country efficiency analysis.

It should be emphasized that the final value of the X-factor depends not only on the results of the conducted analysis, but also on the interpretation of those results and on the estimates of the regulators that make the final decisions. Moreover, it is important to recognize the problem of determining the level of business efficiency as an important step in setting the X-factor, which also includes determining the dynamics of efficiency improvement. Consequently, the regulator must determine the X-factor for each year of the regulatory period.

Relating to the price cap equation, Table I demonstrates the impact of the X-factor on a price cap in relation to the inflation factor (I-factor), which is greater than zero.

TABLE I. INFLUENCE OF THE X-FACTOR ON PRICE CAP

X-factor (the cases)	Price [a]
when $X < 0$	increase faster than inflation
when $X = 0$	increase according to inflation
when $0 < X < 1$	increase slower than inflation
when $X = 1$	constant
when $X > 1$	decrease

a. It is defined using a typical price-cap: $P_{(t+1)} = P_{(t)} \cdot (1+I-X)$.

V. KEY COMPONENTS TO ASSESS CAPITAL-RELATED COSTS

Generally speaking, it is imperative for the regulated utilities to cover capital financing costs. At this point, it should be emphasized that regulators are responsible for the regulation of the distribution of electricity. Therefore, the criterion by which regulators determine key components that can be utilized to assess capital-related costs is of utmost importance. These components are the Regulatory Asset Base (RAB) and the Weighted Average Cost of Capital (WACC). Table II illustrates the characteristics of RAB and WACC.

It is very important to properly determine the initial value of RAB because this is a value at which the owners of assets earn a return on capital over assets economic-life (as depreciation). The regulatory objectives for asset valuation include the following:

- the assurance that annual revenue is sufficient to maintain the asset in its current state,
- the incentives for both efficient investment and maintenance,
- the ability of utilities to finance future investments,
- the assurance that the costs of inefficient investments are not paid by customers,
- the assurance that approved tariffs are appropriate,
- the avoidance of large increases in tariffs,
- the earnings cover the costs of capital and running the business.

TABLE II. KEY COMPONENTS THAT CAN BE UTILIZED TO ASSESS CAPITAL-RELATED COSTS

Question	Key Components	
	RAB	***WACC***
What does the component represent?	The regulator's assessment of the value of current investment in the regulated utility at any given time.	The annual rate of return that investor demands for its investment.
What is the aim?	Providing a revenue stream that has a present value equal to the regulatory asset base.	Determining a fair return on capital.
What is the key regulatory challenge?	Determining the initial value of the RAB. For subsequent regulatory periods, the regulators often use a "roll-forward" process [a] to adjust the initial value of the RAB to reflect changes.	To implement WACC properly. The estimation of WACC is an important part of the price process control review.
Why is it important?	It is important to establish the cost of capital.	It is important to ensure that returns are equal to the opportunity cost of capital.

a. *In rolling forward assets it is very important to choose an appropriate index and to define the appropriate timing of new investments.*

The regulators should publish the contents of a fair return on capital transparently to avoid controversy during regulatory reviews. In principle, determining a fair return on capital involves estimating the capital attraction rate for each component. Starting with a country risk, regulators often consider the following factors to determinate rate of return:

- the annual revaluation of assets,
- returns of other utilities that have similar risks,
- utility status with regard to position of monopoly,
- vulnerability of the revenue stream to exchange rate movements,
- debt and equity ratio.

The WACC that includes debt plus equity is expressed by the following equation:

$$WACC = R_d\,(1-t)\cdot\left(\frac{D}{V}\right) + R_e\cdot\left(1-\frac{D}{V}\right) \qquad (9)$$

In (9) the parameters are:

- R_d – cost of debt finance measured as risk free-rate plus a debt premium over this rate,
- R_e – cost of equity finance,
- t – tax rate,
- V – total market value of the utility,
- D/V – gearing ratio.

In addition, the total market value of the utility V is calculated by summing the market value of the utility's equity E and the market value of the utility's depth D.

The following rule is generally valid: the higher a utility's WACC, the harder it is for a utility to fund future projects. Therefore, using the WACC, regulators ensure that returns are equal to the opportunity cost of capital. There are several models adopted and used by regulators to estimate the cost of equity funds such as the Capital Asset Pricing Model, the Dividend Growth Model, the Price Earnings Ratio, the Arbitrage Pricing Theory, etc. A more detailed explanation of these models is interesting, but is outside the scope of this paper. The regulators often use the Capital Asset Pricing Model to measure the cost of equity. According to the Capital Asset Pricing Model, the cost of equity is expressed by the following equation:

$$K_e = R_f + \beta(R_m - R_f) \qquad (10)$$

In (10) the parameters are:

- R_f – risk-free rate on treasury securities,
- β – equity beta, which measures the relative risk of the utility compared to the market,
- R_m – level of market return.

At this point, it should be emphasized that the mathematical expression ($R_m – R_f$) in (10) represents the market risk premium. Furthermore, β ($R_m – R_f$) represents the market risk premium of the utility capital.

CONCLUSION

As it is discussed in the paper, the regulators implement different methods of regulation to ensure the development of utilities and the electricity market as well as the protection of consumers.

An efficient regulation ensures incentives for the increase of business efficiency of the regulated utilities and a proper determination of the key components that can be utilized to assess capital-related costs (the Regulatory Asset Base and the Weighted Average Cost of Capital).

Incentive regulation contributes to the electricity supply at the most competitive price. Ensuring a well-established cooperation between regulators and utilities is of utmost importance for implementing a successful incentive regulation in the electricity sector.

The European Commission presented the legislative proposal “Clean Energy for all Europeans" in November 2016, which implicates a new electricity market design relating to the rules towards the Energy Union. In conclusion, it is evident that modeling future regulation, including issues of impact on demand and profiles related to the future smart grids, could be a challenging task.

REFERENCES

[1] Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity, OJ L 027; Directive 98/30/EC of the European Parliament and of the Council of 22 June 1998 concerning common rules for the internal market in natural gas, OJ L 204.

[2] Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, OJ L176/37; 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, OJ L176/57.

[3] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, OJ L 211; Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC, OJ L 211.

[4] Communication from the Commission to the European parliament, the Council, the European economic and social committee, the Committee of the regions and the European investment bank, "Clean Energy For All Europeans", COM(2016) 860 final, Brussels, 30.11.2016.

[5] E. Banovac, M. Stojkov, and D. Kozak, "Designing a global energy policy model," Proceedings of the Institution of Civil Engineers – Energy, vol. 170, Issue EN1, 2017, pp. 2-11.

[6] E. Banovac,“Monitoringgrundlagen derkroatischen Regulierungsbehörde für Energie (in German)," EW – das Magazin für die Energie Wirtschaft, vol 103, Issue 1-2, 2004, pp. 14-16.

[7] T. Prosser, "Models of Economic and Social Regulation," in: Dawn Oliver, Tony Prosser, Richard Rawlings (eds) The Regulatory State: Constitutional Implications. Oxford University Press, pp. 34–49, 2010.

[8] G. A. Comnes, S. Stoft, N. Greene, and L. J. Hill, "Performance-based ratemaking for electric utilities: review of plans and analysis of economic and resource planning issues," Volume I. Oak Ridge, Ten. Oak Ridge National Laboratory and University of California, Berkeley, 1995.

[9] A. Kahn, "The Economics of Regulation: Principles and Institutions," Cambridge, MA: MIT Press, 1988.

[10] G. Rothwell and T. Gomez, "Electricity Economics: Regulation and Deregulation," Piscataway: IEEE Press, 2003.

[11] E. Banovac and I. Kuzle, "Applicability of the LASPs in the electric-power industry," Proceedings of the International IEEE Conference EUROCON 2009, Saint Petersburg, Russia, May 18-23, 2009, pp. 1152-1157.

[12] E. Banovac and D. Kozak, "An analytic review of the characteristics of the lot acceptance sampling plans used for acceptance of large lots," International Review of Electrical Engineering (I.R.E.E.), vol. 3, No. 6, 2008, pp. 1070-1076.

[13] E. Banovac and I. Štritof, "Analysis of applicable methods of incentive regulation in the field of distribution of electricity," WSEAS Transactions on systems, vol. 4, Issue 8, 2005, pp. 1224-1232.