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Description of Essential Factors for Successful Reform of Electricity Sector in Croatia

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Abstract: - This paper deals with the problems concerning the choice of electricity market model in Croatia. At the moment, Croatian electricity market is opened app. 14%. This is obviously too little particularly because the Republic of Croatia has started accession talks with European Union regarding its membership and this membership implies faster opening of the market as well as the most efficient market model. It also gives positive and negative aspects of the regulation because regulation affects liberalization of electricity market very directly, encourages investments in power supply field and prevents monopolistic behavior on the market. The presented scheme includes possible partners in the open power supply field as well as regulatory effect toward the market in the last three years. The paper also analyses the questions concerning the structure and organization of electricity market which are vital for the proper choice of electricity market model.

Key-Words: - Electricity Market, License, Market Model, Regulation of Energy Activities

1 Introduction

The reform of electric power supply sector is necessary in order to make power supply market liberal. It is based upon Directives 2003/54/EC [1] and requires an adequate electricity market model. This process:

- influences all subjects on the market and their relationships,
- requires an independent regulatory body (interacting with the law and government institutions),
- requires relevant licenses issued by regulatory body,
- depends on energy buyers' understanding of its goals and consequences as well as on their readiness to changes which can often be rather substantial.

When a specific electricity market is analyzed it is important to take into consideration both characteristics and disadvantages of the existing power supply system. Furthermore, expenses and revenue should be determined for each power supply subject in order to define spheres of interest and prevent multiple subventions. While choosing the electricity market model certain technical, financial and managing restrictions appear. Technical restrictions include generating capacities, transmission problems, interactions with neighboring networks, types of electricity meters (installed in customers' homes). Limitations of financial and managing activities refer to: substantial losses (technical and commercial), tariff system methodology, subventions of specific customer category, and characteristics of the managing system – particularly when challenges regarding adaptability to new conditions of liberalized market are concerned.

2 Electricity market model

The important component of power supply sector reform is the proper choice of the market model as well as elaboration of rules governing electricity market. It is always necessary to define partners on the market and determine their relationship in a clear and consistent way. In so doing energy flow, financial sources and parties to a contract should be taken into consideration. The above relationships have to be stated very clearly

since they are important for the monitoring and operation of electricity market. The proper choice of the model and rules governing the electricity market will increase efficiency and reduce the price of electric power with regard to the prices of the old illiberal market. It is necessary to examine specific characteristics of the country in question, its power supply system and financial market. When choosing the market model, the following should be determined:

- partners on the market, their rights and commitments,
- price structure,
- legal regulation, i.e. all necessary documents,
- all contracts between partners on the market including financial flows which result from the above relationships,
- procedure carried out by the national regulatory body concerning permissions (licenses) for power supply activities.

Figure 1 shows possible partners on the open electricity market[1].

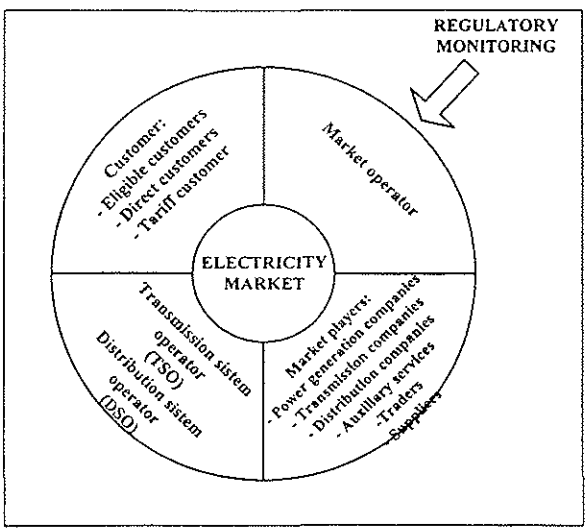


Fig. 1 Players in open electricity market

In order to participate on electricity market, power generation companies need the permission for performing electric energy activities. Croatian Energy Law [2] passed in 2001 determined seven power supply activities, as follows:

- generation of electricity,
- transmission of electricity,
- distribution of electricity,
- retail supply of electricity,
- electric power supply management,
- organization of the electricity market,
- trading, mediating and representing on electricity market.

Croatian Energy Law [3] was changed in December 2004, i.e. electric power supply management[2] was left out, leaving only six power supply activities. By defining rights and commitments of partners (who have been given permission), fundamentals of electricity market structure have been established and relationships in the market model have been determined. The role of regulatory body (in Croatian power supply sector, it is called Croatian Energy Regulatory Agency – CERA[3]) is to enable particular partner to enter Croatian market based on regular permission for performing definite power supply activity as well as regulatory monitoring of that particular partner. In addition, the Agency supervises Market operator, because the new Law on Electricity Market [4] replaced ISMO concept (Independent System and Market Operator) introduced by the previous 2001 law by TSO concept (Transmission System Operator) and at the same time establishing Market operator. In order to put this concept into practice, it is necessary to change certain regulations which are, at the moment when this paper is being written, discussed and elaborated. These regulations are:

- General conditions for electric power supply,
- Rules for electricity market,
- Network rules for power supply activities,
- Tariff systems and methodology for determining tariffs for four power supply activities,
- Regulation on conditions for carrying out an energy activity and
- Regulation for stimulating renewable energy sources and cogeneration.

3 Regulation of energy activities

In its broad sense, the concept of regulation of energy activities generally includes laws and regulations as well as methods used to establish control over power companies decisions and influence on their doing business and transactions. A narrower concept is so called economic regulation which uses PBR

[1] Allowing third parties transparent and non discriminatory admission.

[2] Power system managment was shifted to HEP, i.e. Croatian TSO.

[3] Instead of the full name Croatian Energy Regulatory Agency, the abbreviation CERA or Agency will be used.

method – Performance Based Regulation [5] referring to the questions of revenue, prices, efficiency, distribution of risks, level of services etc. According to the literature, the basic argument for introduction of regulation is to eliminate market disadvantages in order to achieve transparent and stimulating conditions for market competition.

EU introduced obligatory regulation of energy activities same ten years ago by accepting Directive 96/92/EC. That Directive had the goal to create adequate and effective mechanisms for regulation, control and transparency in order to avoid all possible dominant position and predatory behavior particularly when customers are in question.

Regulation in electric power system represents activities of an independent regulatory body which should prevent monopolistic behavior of vertically integrated power generated companies. Therefore, regulation represents a lawful continuous monitoring of power generating companies whose goals are control of level of strategic parameters [6] such as price, investments, quality, purchase - e.g. fuel.

It is important to point out that regulation goals are the component of chosen policy in a certain country and has to be coordinated with the common goal – opening of the electricity market and finally an overall opening of the competitive market. The concept of an open electricity market refers to those power supply activities which operate according to the market principles and not based on so called natural monopolies. They operate as Public Service Obligation – PSO, e.g. transmission networks. Transmission of electric energy is submitted to regulation carried out by a relevant regulatory body.

Basic goals of electric power regulation are:
- equal and non discriminatory conditions for all participants on the electricity market, i.e. clear and unbiased approach is expected,
- regulated approach to transmission is taken care of,
- tariffs and tariff systems methodology is determined,
- efficient energy market and market competition is established,
- protection of both electric energy customers and electric energy subjects – particularly by taking into consideration financial viability of partners in the electricity market.

Furthermore, regulation should encourage and support:
- investments in power supply system,
- efficient and economic use of electric energy,
- power supply entrepreneurship and
- environment protection.

However, regulation goals are not directed only the above issues since some of them are obviously opposed to each other. Regulation should create good balance among the above, e.g. between customers' interest and companies' interest. Attention should be paid to positive and negative balance of regulation aspects in power supply sector, as it is presented in Table 1.

Table 1 Positive and negative aspects of regulation

POSITIVE ASPECTS	NEGATIVE ASPECTS
▪ price reduction ▪ safety of supply increase ▪ public service obligation ▪ service standards resulting in quality rise ▪ market competition increase ▪ efficiency increase ▪ stimulating power supply activities ▪ ensuring non discriminatory approach to networks	▪ increase of expenses caused by: - costs of regulatory body - costs of employees dealing with regulation activities ▪ decision making freedom in regulated power supply subjects ▪ lack of stimulation for foreign investments in regulated companies

The processes of restructuring, liberalization and deregulation of the power systems, certain new rules are imposed, i.e. technical, financial and institutional – establishing of regulatory body. First of all, economic regulation methods are introduced to monitor players in electricity market in order to protect customers wherever market competition is not established or where natural monopoly exists, i.e. transmission lines.

4 The license for carrying out an energy activity

The most important regulatory task of the Agency (CERA), which provides legal power

supply activities in Croatia, is licensing[4]. Licensing means the procedure by which regulatory body verifies conditions prescribed by the law and which the power supply company should fulfill in order to get the permission from the Agency and in so doing be granted the status of energy operator. Moreover, the access to the electricity market is allowed only to those companies which have been given the licenses for carrying out power supply activities. The goals (primary and secondary) achieved by means of this procedure[5] are described in [7] and in Figure 2.

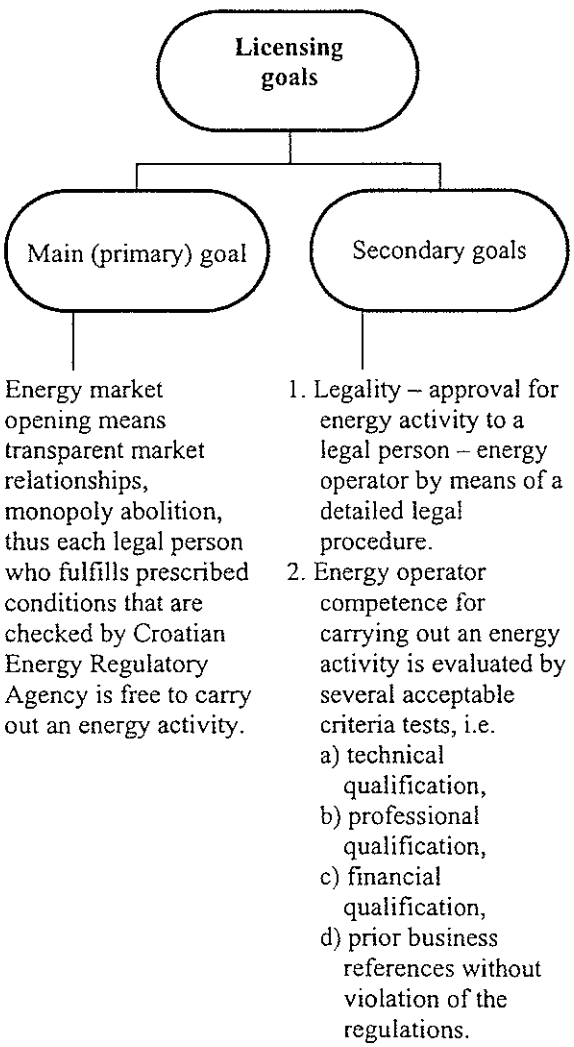


Fig. 2 Licensing procedure goals

[4] This general concept includes handling a number of procedures by the Agency which result in giving licenses to power supply subjects for power supply activities according to the Energy Law.

[5] The process (a number of procedures) for issuing permissions for power supply activities determined by the law is usually known as licensing.

An energy operator has to keep the required level of technical, financial and professional qualifications in order to meet the requirements stated in the license for power supply activity. Articles 5, 6 and 7 in Regulation on conditions for carrying out an energy activity [8] gives important conditions for issuing license, therefore giving conditions for undisturbed, continuous and safe power supply activities. Agency is authorized to monitor the conditions - technical and financial as well as professional qualifications during the period for which the license is valid. Monitoring process that is carried out by the regulatory authorities is described in [9].

In case the Agency is informed officially or by an authorized inspector that the subject does not meet the requirements from the Regulations, the license may be cancelled. From the above, it is evident that this regulatory monitoring carries weight, because when a subject is taken the license away, his further activities in the sector of power supply are not allowed.

Power supply subject must be filed in the Commercial court in order to be able to perform activities in the field of power supply. Thus, legal obligation of each subject is to obtain relevant license issued by a regulatory body and Act for regulating the period in which the subject is given the license for dealing with power supply activities brought by the Government of the Republic of Croatia. The process was led by the Agency and there were several hundred of meetings, contacts and consultations about that matter. Analyzing the data and documents obtained, regulatory body carries out a direct inspection into the conditions of power supply structure in question (facilities, plants, devices, network, vehicles and equipment) checking the ability of the subject to fulfill the required conditions. After the procedure of checking is finished, an official decision for performing power supply activities is given (the license for performing power supply activity).

It is important to point out that the process of monitoring (checking the conditions for licensing) is a long and continuous work of the Agency.

At the time when this paper was written (September 2005) approximately 145 companies were licensed, some of them asked for permission to manage different energy activities. The distribution of applications for

different energy activities is presented in Figure 3. Out of these 213 applications the Agency has finished procedures for 196 and has given them relevant permission for particular energy activities. Figure 3 shows that the following two energy activities are the most common:

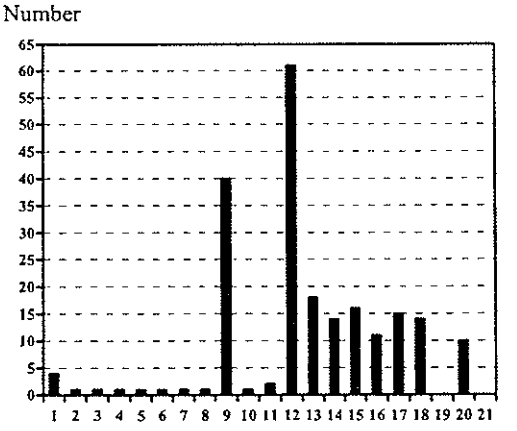
- transportation of oil derivatives through product pipelines and other means of transportation (28,6%),
- gas distribution (18,7%).

In fact gas distribution data show large segmentation of that activity in Croatian energy sector. On the other hand, power supply activities are performed by a much smaller number of power supply players, i.e. only one in distribution and supply. This situation can be considered insufficient for further opening of the market. However, the situation is slightly improved by the fact that energy activities like trading, mediation and representation in the energy market include 14 companies most of them referring to electric energy.

At the moment Croatian electricity market is opened for about 14% and there are 39 customers who have obtained the status of eligible customers, because, according to Croatian rules their consumption exceeds 20 GWh electric energy a year[6]. Total annual consumption in the Republic of Croatia is 16 TWh. Nevertheless, the Law on Electricity Market prescribes a fast market opening and that is:

- July 1st 2006 for customers whose consumption exceeds 9 GWh,
- July 1st 2007 for customers - entrepreneurs,
- July 1st 2008 for all customers.

Eligible customer cannot lose his status as long as he keeps his consumption based upon the eligible customer status which he achieved before. The law states that after obtaining the status, eligible customers have to choose their supplier within the period of six months. During that period they are entitled to electric power supply by the public supplier according to the tariff system of electric power supply with the exemption of eligible customers. The eligible customer (household or small customer category) does not want to realize the right of eligible customer or does not manage to find a supplier, power supply is then negotiated with the public supplier according to the tariff system of electric power supply with the exemption of eligible customers. If eligible customer supplier stops his activities, eligible customer should find a new supplier within thirty days. During that period he is entitled to electric power supply by the public supplier according to the tariff system of electric power supply with the exemption of eligible customers.



LEGEND - Number corresponding to particular energy activity:

1. generation of electricity - 4
2. transmission of electricity - 1
3. distribution of electricity - 1
4. retail supply of electricity - 1
5. management of the electric energy system - 1
6. organization of the electricity market - 1
7. supply of gas - 1
8. gas transportation - 1
9. gas distribution - 40
10. production of oil derivatives - 1
11. transportation of oil through oil pipelines and other means of transportation - 2
12. transportation of oil derivatives through product pipelines and other means of transportation - 61
13. wholesale of oil derivatives - 18
14. oil and oil derivatives storage - 14
15. heat generation - 16
16. heat distribution - 11
17. heat energy supply - 15
18. trading, mediation and representation in the energy market - 14
19. transportation and storage of LNG - 0
20. wholesale and retail of LPG - 10
21. wholesale of LNG - 0

Fig. 3 Distribution of applications corresponding to energy activities

5 Structure and organization of the electricity market

During the period of European liberalization in all developed countries creation of competitive

[6] Annual consumption which gives a customer the status of "eligible customers" and refers to all measuring points.

electricity market as well as changes in national power supply sectors occurred. Until the nineties last century in most countries in the world vertically integrated companies had monopoly over power supply activities and consequently were responsible for safety and reliability of EESs. Gradual opening of electricity markets brought about the following models of electric power market structure:

1. Single Buyer Model,
2. Wholesale Competition Model,
3. Retail Competition Model.

Single Buyer Model means monopoly model and one buyer, which is not acceptable in EU policy, because it is opposite to the principle of free market. In that case, third parties access and market competition are not possible.

Wholesale Competition Model and Retail Competition model introduce market competition for wholesale or retail sale. Applying one of these models, buyers should make profit long-term. Naturally, how and how much profit will be realized depends on the way in which energy subjects manage the risks. Furthermore, in order to make the best out of the market opening advantages it is necessary to stimulate the development of new technologies and introduce efficient regulation of transmission in particular, because it remains monopolistic even in open markets. Table 2 shows main characteristics and disadvantages of wholesale and retail sale model.

Table 2 Characteristics for wholesale and retail sale model

WHOLESALE MODEL	RETAIL SALE MODEL
DISADVANTAGES	
* Requires partial restructuring of power supply system. * Possibility of risks due to abrupt and frequent changes of production costs and prices on the market. * Risk of decreasing system reliability.	* Requires complete restructuring of the system. * Increases risks because it relies on market mechanism which would guarantee bigger benefits for the customers. * Costs related to connecting devices are considerably bigger, and this, in fact, does not allow small customers to choose the supplier. * Causes high transition costs which include significant administrative expenses due to defining ways and conditions of using networks (transmission and distribution[7]). * Risks regarding safety of supply and system reliability are increased.
MAIN CHARACTERISTICS	
* Only a limited number of customers may choose their supplier. These customers are usually determined by the quantity of their annual consumption[8] or the place of their network connection – e.g. direct customers in transmission network. * All smaller customers are supplied by a big public service obligation supplier. * Competition is introduced in generation and supply segment of wholesale. * Electric power price risks are transferred from the customers[9] to suppliers and eligible customers. * An open approach to transmission networks. * There is the possibility of efficiency development if customers are informed about time structure prices. * Decrease of political influence with respect to monopoly structure which greatly depends on transparent legislative and technical regulations. * It is the forerunner of completely opened market where all buyers are free to choose their power energy supplier. * Decrease of public sector when investments and demands are considered.	* All buyers are allowed to choose their supplier regardless the level of annual consumption. * Characteristics similar to those of wholesale. * Free approach to transmission lines is required. * Free approach to distribution lines is required. * Unbundling is required because regulated activity should be separated from market activity, i.e. distribution activity should be separated from supply.

[7] Regulatory body should determine fees for the use of transmission and distribution networks (see the description in [10]).

[8] In most countries whose markets have not been completely opened yet this limit is 9 GWh consumption a year.

[9] In a non-market environment, customers bear all the risks.

It is evident that when an acceptable[10] market model is chosen, it is important to pay attention to risks which the chosen model implies. Therefore, adequate rules and technical standards for improving market model development should be provided. It is also necessary to foresee measures for decreasing and controlling market competition risks.

By developing market competition a greater number of market players are generated. Rules and contracts have to determine rights and obligations between the players. Consequently, market competition increases the number of transactions concerning power supply trading and financial instruments are developed.

For successful establishing of the institutions which deal with electric energy, it is necessary to bring about several rules with the goal:

- to determine the rights for taking part in organized market,
- to solve the problems of organization and the way in which the tasks are carried out,
- to determine the ways of calculating price,
- to define possible kinds of contracts.

First electricity markets were established in Great Britain and Scandinavia at the beginning of the nineties last century. By adopting Directive 96/92/EC, markets are gradually introduced in other EU countries as well as candidate countries. In so doing, one rule was established, i.e. these markets developed trading of electric energy first, and then financial markets controlling market risks were developed. Thus, there are different models for electricity market organization, because electric energy represents specific goods from the market point of view. Due to its physical properties, it cannot be traded successfully in spot market which means prompt delivery, i.e. prompt market. This is the reason why electricity market has to be organized and planned earlier and in advance[11] with respect to the delivery of electric energy itself. In so doing, differences appear between planned and delivered quantities of electric energy, and these differences are established and paid for in the way which is not always compatible with the market principles.

[10] Taking into consideration political, economical, technical and social characteristics.

[11] For example, transactions are planned earlier, one day, one hour or five minutes in advance.

In practice there are two configurations of organized power market which replace the ideal spot market:

1. Pool model with two variants;
   a) Mandatory Pool where it is obligatory to trade energy through the pool.
   b) Voluntary Pool, where pool is not obligatory, i.e. trading is possible through bilateral contracts.
2. Power Exchange and bilateral contracts at the same time.

It is important to point out that Pool model forms prices based on optimization process which is centralized. This process is based on marginal costs of supply and demand, while the final price is established by summing up balance expenses, auxiliary services and other possible compensations with regard to the price on the pool. Pool model is mostly used in Anglo-Saxon countries, voluntary pool prevailing. Mandatory pool was established in England and Wales during the nineties and at that time it was considered a good example of the well organized market. Electric energy prices were defined for every half-an-hour period based on a day ahead principle auctions. In 2000, electric energy market was reformed, i.e. NETA was introduced (New Electricity Trading Arrangements). It cancelled Mandatory Pool and introduced Power Exchange.

In the system in which trading is carried out by means of bilateral contracts, market operator and system operator are organized as two separate institutions. System operator is responsible for technical balance of the system, including dispatching as well, whereas market operator organizes trading between market players paying attention to all contracts.

Power exchange is owned mostly by subjects, traders and brokers who use it in a certain way. It is similar to stock exchange which is established on financial market. Power exchange represents a non compulsory way of electric power trading, both bilateral and over-the-counter trading is possible. There are several types of power exchange organizations such as:

- Term market where the contracts include energy supply at the definite moment in the future and at a fixed price,
- Short term market (so called spot market) trades physical quantities of electric power a day ahead, as a rule.

6 Conclusion

Liberalization of the market leads to increased number of the subjects on the market. Written documents and contracts should include rights, commitments and relationship of the subjects involved. At the very beginning it is essential that the regulatory body carries out the licensing procedure in order to give them the licenses for reliable performance of certain power supply activities as well as an access to the electricity market where they appear as subjects.

Today, there are four companies which generate electric power, one is in transmission, one in distribution and in supply in Croatian electricity market, while 14 companies are involved in trading, mediation and representation in the energy market. Since market competition increases number of transactions connected to electric energy sale, financial instruments and price negotiations with eligible customers are also developed. At present, 20 GWh is an annual consumption limit. An independent market operator is organized and its work is monitored by Croatian Energy Regulatory Agency (CERA). Market operator is separated from national electric company (HEP Group) and works in new premises. Presently new Rules for electricity market are being written. In order to establish a successful market model written documents which correspond to liberated energy market are required and they should be in an advanced phase of realization and adopting, i.e. General conditions for electric power supply, Network rules for power supply activities, Stimulation of renewable energy sources and cogeneration.

Republic of Croatia has agreed upon full cooperation and adjustment to liberalization of EU internal electricity market, because Croatia has started negotiations with European Union. The process of establishing of energy community for South East Europe Region (based on Energy Community Treaty) in so called REM process implies organization of electricity market based on EU principles. Although, the fact that the electricity market model in Croatia has not been established yet, it could present an advantage. Namely, when national electricity market model is chosen, it will be important to take into consideration its compatibility with the future regional (South East Europe Region) model.

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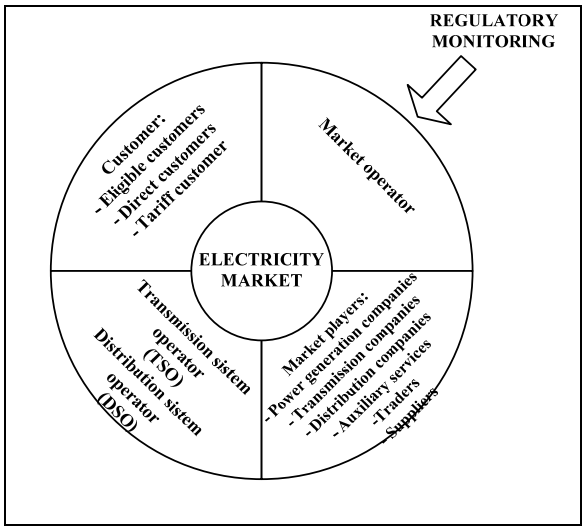

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- Regulation on conditions for carrying out an energy activity and
- Regulation for stimulating renewable energy sources and cogeneration.

3 Regulation of energy activities

In its broad sense, the concept of regulation of energy activities generally includes laws and regulations as well as methods used to establish control over power companies decisions and influence on their doing business and transactions. A narrower concept is so called economic regulation which uses PBR

[1] Allowing third parties transparent and non discriminatory admission.

[2] Power system managment was shifted to HEP, i.e. Croatian TSO.

[3] Instead of the full name Croatian Energy Regulatory Agency, the abbreviation CERA or Agency will be used.

method – Performance Based Regulation [5] referring to the questions of revenue, prices, efficiency, distribution of risks, level of services etc. According to the literature, the basic argument for introduction of regulation is to eliminate market disadvantages in order to achieve transparent and stimulating conditions for market competition.

EU introduced obligatory regulation of energy activities same ten years ago by accepting Directive 96/92/EC. That Directive had the goal to create adequate and effective mechanisms for regulation, control and transparency in order to avoid all possible dominant position and predatory behavior particularly when customers are in question.

Regulation in electric power system represents activities of an independent regulatory body which should prevent monopolistic behavior of vertically integrated power generated companies. Therefore, regulation represents a lawful continuous monitoring of power generating companies whose goals are control of level of strategic parameters [6] such as price, investments, quality, purchase - e.g. fuel.

It is important to point out that regulation goals are the component of chosen policy in a certain country and has to be coordinated with the common goal – opening of the electricity market and finally an overall opening of the competitive market. The concept of an open electricity market refers to those power supply activities which operate according to the market principles and not based on so called natural monopolies. They operate as Public Service Obligation – PSO, e.g. transmission networks. Transmission of electric energy is submitted to regulation carried out by a relevant regulatory body.

Basic goals of electric power regulation are:
- equal and non discriminatory conditions for all participants on the electricity market, i.e. clear and unbiased approach is expected,
- regulated approach to transmission is taken care of,
- tariffs and tariff systems methodology is determined,
- efficient energy market and market competition is established,
- protection of both electric energy customers and electric energy subjects – particularly by taking into consideration financial viability of partners in the electricity market.

Furthermore, regulation should encourage and support:
- investments in power supply system,
- efficient and economic use of electric energy,
- power supply entrepreneurship and
- environment protection.

However, regulation goals are not directed only the above issues since some of them are obviously opposed to each other. Regulation should create good balance among the above, e.g. between customers' interest and companies' interest. Attention should be paid to positive and negative balance of regulation aspects in power supply sector, as it is presented in Table 1.

Table 1 Positive and negative aspects of regulation

POSITIVE ASPECTS	NEGATIVE ASPECTS
▪ price reduction ▪ safety of supply increase ▪ public service obligation ▪ service standards resulting in quality rise ▪ market competition increase ▪ efficiency increase ▪ stimulating power supply activities ▪ ensuring non discriminatory approach to networks	▪ increase of expenses caused by: - costs of regulatory body - costs of employees dealing with regulation activities ▪ decision making freedom in regulated power supply subjects ▪ lack of stimulation for foreign investments in regulated companies

The processes of restructuring, liberalization and deregulation of the power systems, certain new rules are imposed, i.e. technical, financial and institutional – establishing of regulatory body. First of all, economic regulation methods are introduced to monitor players in electricity market in order to protect customers wherever market competition is not established or where natural monopoly exists, i.e. transmission lines.

4 The license for carrying out an energy activity

The most important regulatory task of the Agency (CERA), which provides legal power

supply activities in Croatia, is licensing[4]. Licensing means the procedure by which regulatory body verifies conditions prescribed by the law and which the power supply company should fulfill in order to get the permission from the Agency and in so doing be granted the status of energy operator. Moreover, the access to the electricity market is allowed only to those companies which have been given the licenses for carrying out power supply activities. The goals (primary and secondary) achieved by means of this procedure[5] are described in [7] and in Figure 2.

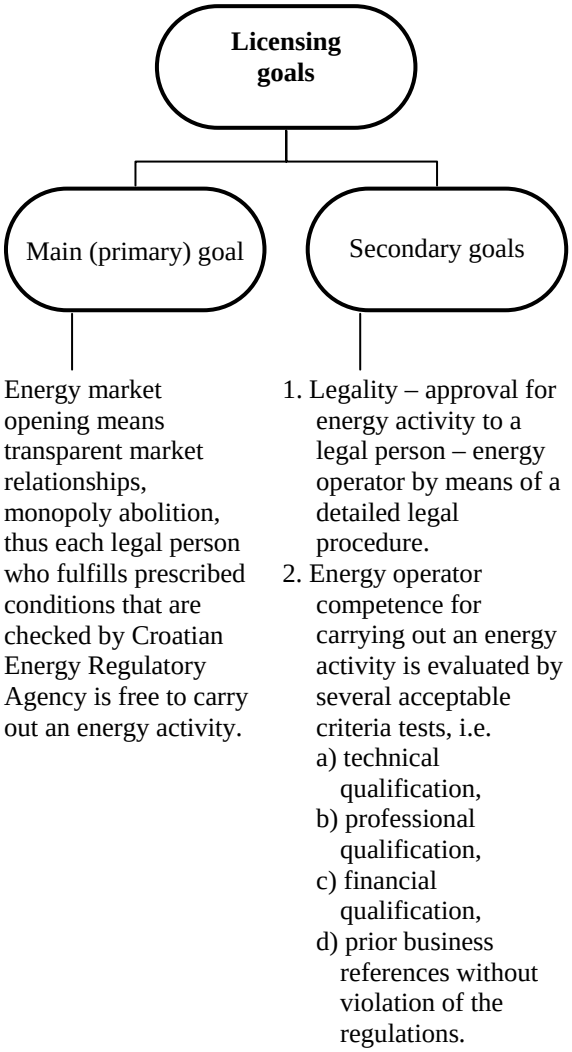


Fig. 2 Licensing procedure goals

[4] This general concept includes handling a number of procedures by the Agency which result in giving licenses to power supply subjects for power supply activities according to the Energy Law.

[5] The process (a number of procedures) for issuing permissions for power supply activities determined by the law is usually known as licensing.

An energy operator has to keep the required level of technical, financial and professional qualifications in order to meet the requirements stated in the license for power supply activity. Articles 5, 6 and 7 in Regulation on conditions for carrying out an energy activity [8] gives important conditions for issuing license, therefore giving conditions for undisturbed, continuous and safe power supply activities. Agency is authorized to monitor the conditions - technical and financial as well as professional qualifications during the period for which the license is valid. Monitoring process that is carried out by the regulatory authorities is described in [9].

In case the Agency is informed officially or by an authorized inspector that the subject does not meet the requirements from the Regulations, the license may be cancelled. From the above, it is evident that this regulatory monitoring carries weight, because when a subject is taken the license away, his further activities in the sector of power supply are not allowed.

Power supply subject must be filed in the Commercial court in order to be able to perform activities in the field of power supply. Thus, legal obligation of each subject is to obtain relevant license issued by a regulatory body and Act for regulating the period in which the subject is given the license for dealing with power supply activities brought by the Government of the Republic of Croatia. The process was led by the Agency and there were several hundred of meetings, contacts and consultations about that matter. Analyzing the data and documents obtained, regulatory body carries out a direct inspection into the conditions of power supply structure in question (facilities, plants, devices, network, vehicles and equipment) checking the ability of the subject to fulfill the required conditions. After the procedure of checking is finished, an official decision for performing power supply activities is given (the license for performing power supply activity).

It is important to point out that the process of monitoring (checking the conditions for licensing) is a long and continuous work of the Agency.

At the time when this paper was written (September 2005) approximately 145 companies were licensed, some of them asked for permission to manage different energy activities. The distribution of applications for

different energy activities is presented in Figure 3. Out of these 213 applications the Agency has finished procedures for 196 and has given them relevant permission for particular energy activities. Figure 3 shows that the following two energy activities are the most common:

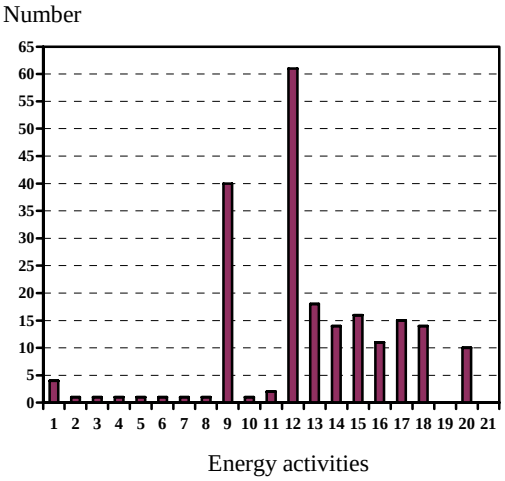
- transportation of oil derivatives through product pipelines and other means of transportation (28,6%),
- gas distribution (18,7%).

In fact gas distribution data show large segmentation of that activity in Croatian energy sector. On the other hand, power supply activities are performed by a much smaller number of power supply players, i.e. only one in distribution and supply. This situation can be considered insufficient for further opening of the market. However, the situation is slightly improved by the fact that energy activities like trading, mediation and representation in the energy market include 14 companies most of them referring to electric energy.

At the moment Croatian electricity market is opened for about 14% and there are 39 customers who have obtained the status of eligible customers, because, according to Croatian rules their consumption exceeds 20 GWh electric energy a year[6]. Total annual consumption in the Republic of Croatia is 16 TWh. Nevertheless, the Law on Electricity Market prescribes a fast market opening and that is:

- July 1st 2006 for customers whose consumption exceeds 9 GWh,
- July 1st 2007 for customers - entrepreneurs,
- July 1st 2008 for all customers.

Eligible customer cannot lose his status as long as he keeps his consumption based upon the eligible customer status which he achieved before. The law states that after obtaining the status, eligible customers have to choose their supplier within the period of six months. During that period they are entitled to electric power supply by the public supplier according to the tariff system of electric power supply with the exemption of eligible customers. The eligible customer (household or small customer category) does not want to realize the right of eligible customer or does not manage to find a supplier, power supply is then negotiated with the public supplier according to the tariff system of electric power supply with the exemption of eligible customers. If eligible customer supplier stops his activities, eligible customer should find a new supplier within thirty days. During that period he is entitled to electric power supply by the public supplier according to the tariff system of electric power supply with the exemption of eligible customers.



LEGEND - Number corresponding to particular energy activity:

1. generation of electricity - 4
2. transmission of electricity - 1
3. distribution of electricity - 1
4. retail supply of electricity - 1
5. management of the electric energy system - 1
6. organization of the electricity market - 1
7. supply of gas - 1
8. gas transportation - 1
9. gas distribution - 40
10. production of oil derivatives - 1
11. transportation of oil through oil pipelines and other means of transportation - 2
12. transportation of oil derivatives through product pipelines and other means of transportation - 61
13. wholesale of oil derivatives - 18
14. oil and oil derivatives storage - 14
15. heat generation - 16
16. heat distribution - 11
17. heat energy supply - 15
18. trading, mediation and representation in the energy market - 14
19. transportation and storage of LNG - 0
20. wholesale and retail of LPG - 10
21. wholesale of LNG - 0

Fig. 3 Distribution of applications corresponding to energy activities

5 Structure and organization of the electricity market

During the period of European liberalization in all developed countries creation of competitive

[6] Annual consumption which gives a customer the status of "eligible customers" and refers to all measuring points.

electricity market as well as changes in national power supply sectors occurred. Until the nineties last century in most countries in the world vertically integrated companies had monopoly over power supply activities and consequently were responsible for safety and reliability of EESs. Gradual opening of electricity markets brought about the following models of electric power market structure:

1. Single Buyer Model,
2. Wholesale Competition Model,
3. Retail Competition Model.

Single Buyer Model means monopoly model and one buyer, which is not acceptable in EU policy, because it is opposite to the principle of free market. In that case, third parties access and market competition are not possible.

Wholesale Competition Model and Retail Competition model introduce market competition for wholesale or retail sale. Applying one of these models, buyers should make profit long-term. Naturally, how and how much profit will be realized depends on the way in which energy subjects manage the risks. Furthermore, in order to make the best out of the market opening advantages it is necessary to stimulate the development of new technologies and introduce efficient regulation of transmission in particular, because it remains monopolistic even in open markets. Table 2 shows main characteristics and disadvantages of wholesale and retail sale model.

Table 2 Characteristics for wholesale and retail sale model

WHOLESALE MODEL	RETAIL SALE MODEL
DISADVANTAGES	
* Requires partial restructuring of power supply system. * Possibility of risks due to abrupt and frequent changes of production costs and prices on the market. * Risk of decreasing system reliability.	* Requires complete restructuring of the system. * Increases risks because it relies on market mechanism which would guarantee bigger benefits for the customers. * Costs related to connecting devices are considerably bigger, and this, in fact, does not allow small customers to choose the supplier. * Causes high transition costs which include significant administrative expenses due to defining ways and conditions of using networks (transmission and distribution[7]). * Risks regarding safety of supply and system reliability are increased.
MAIN CHARACTERISTICS	
* Only a limited number of customers may choose their supplier. These customers are usually determined by the quantity of their annual consumption[8] or the place of their network connection – e.g. direct customers in transmission network. * All smaller customers are supplied by a big public service obligation supplier. * Competition is introduced in generation and supply segment of wholesale. * Electric power price risks are transferred from the customers[9] to suppliers and eligible customers. * An open approach to transmission networks. * There is the possibility of efficiency development if customers are informed about time structure prices. * Decrease of political influence with respect to monopoly structure which greatly depends on transparent legislative and technical regulations. * It is the forerunner of completely opened market where all buyers are free to choose their power energy supplier. * Decrease of public sector when investments and demands are considered.	* All buyers are allowed to choose their supplier regardless the level of annual consumption. * Characteristics similar to those of wholesale. * Free approach to transmission lines is required. * Free approach to distribution lines is required. * Unbundling is required because regulated activity should be separated from market activity, i.e. distribution activity should be separated from supply.

[7] Regulatory body should determine fees for the use of transmission and distribution networks (see the description in [10]).

[8] In most countries whose markets have not been completely opened yet this limit is 9 GWh consumption a year.

[9] In a non-market environment, customers bear all the risks.

It is evident that when an acceptable[10] market model is chosen, it is important to pay attention to risks which the chosen model implies. Therefore, adequate rules and technical standards for improving market model development should be provided. It is also necessary to foresee measures for decreasing and controlling market competition risks.

By developing market competition a greater number of market players are generated. Rules and contracts have to determine rights and obligations between the players. Consequently, market competition increases the number of transactions concerning power supply trading and financial instruments are developed.

For successful establishing of the institutions which deal with electric energy, it is necessary to bring about several rules with the goal:

- to determine the rights for taking part in organized market,
- to solve the problems of organization and the way in which the tasks are carried out,
- to determine the ways of calculating price,
- to define possible kinds of contracts.

First electricity markets were established in Great Britain and Scandinavia at the beginning of the nineties last century. By adopting Directive 96/92/EC, markets are gradually introduced in other EU countries as well as candidate countries. In so doing, one rule was established, i.e. these markets developed trading of electric energy first, and then financial markets controlling market risks were developed. Thus, there are different models for electricity market organization, because electric energy represents specific goods from the market point of view. Due to its physical properties, it cannot be traded successfully in spot market which means prompt delivery, i.e. prompt market. This is the reason why electricity market has to be organized and planned earlier and in advance[11] with respect to the delivery of electric energy itself. In so doing, differences appear between planned and delivered quantities of electric energy, and these differences are established and paid for in the way which is not always compatible with the market principles.

In practice there are two configurations of organized power market which replace the ideal spot market:

1. Pool model with two variants;
   a) Mandatory Pool where it is obligatory to trade energy through the pool.
   b) Voluntary Pool, where pool is not obligatory, i.e. trading is possible through bilateral contracts.
2. Power Exchange and bilateral contracts at the same time.

It is important to point out that Pool model forms prices based on optimization process which is centralized. This process is based on marginal costs of supply and demand, while the final price is established by summing up balance expenses, auxiliary services and other possible compensations with regard to the price on the pool. Pool model is mostly used in Anglo-Saxon countries, voluntary pool prevailing. Mandatory pool was established in England and Wales during the nineties and at that time it was considered a good example of the well organized market. Electric energy prices were defined for every half-an-hour period based on a day ahead principle auctions. In 2000, electric energy market was reformed, i.e. NETA was introduced (New Electricity Trading Arrangements). It cancelled Mandatory Pool and introduced Power Exchange.

In the system in which trading is carried out by means of bilateral contracts, market operator and system operator are organized as two separate institutions. System operator is responsible for technical balance of the system, including dispatching as well, whereas market operator organizes trading between market players paying attention to all contracts.

Power exchange is owned mostly by subjects, traders and brokers who use it in a certain way. It is similar to stock exchange which is established on financial market. Power exchange represents a non compulsory way of electric power trading, both bilateral and over-the-counter trading is possible. There are several types of power exchange organizations such as:

- Term market where the contracts include energy supply at the definite moment in the future and at a fixed price,
- Short term market (so called spot market) trades physical quantities of electric power a day ahead, as a rule.

[10] Taking into consideration political, economical, technical and social characteristics.

[11] For example, transactions are planned earlier, one day, one hour or five minutes in advance.

6 Conclusion

Liberalization of the market leads to increased number of the subjects on the market. Written documents and contracts should include rights, commitments and relationship of the subjects involved. At the very beginning it is essential that the regulatory body carries out the licensing procedure in order to give them the licenses for reliable performance of certain power supply activities as well as an access to the electricity market where they appear as subjects.

Today, there are four companies which generate electric power, one is in transmission, one in distribution and in supply in Croatian electricity market, while 14 companies are involved in trading, mediation and representation in the energy market. Since market competition increases number of transactions connected to electric energy sale, financial instruments and price negotiations with eligible customers are also developed. At present, 20 GWh is an annual consumption limit. An independent market operator is organized and its work is monitored by Croatian Energy Regulatory Agency (CERA). Market operator is separated from national electric company (HEP Group) and works in new premises. Presently new Rules for electricity market are being written. In order to establish a successful market model written documents which correspond to liberated energy market are required and they should be in an advanced phase of realization and adopting, i.e. General conditions for electric power supply, Network rules for power supply activities, Stimulation of renewable energy sources and cogeneration.

Republic of Croatia has agreed upon full cooperation and adjustment to liberalization of EU internal electricity market, because Croatia has started negotiations with European Union. The process of establishing of energy community for South East Europe Region (based on Energy Community Treaty) in so called REM process implies organization of electricity market based on EU principles. Although, the fact that the electricity market model in Croatia has not been established yet, it could present an advantage. Namely, when national electricity market model is chosen, it will be important to take into consideration its compatibility with the future regional (South East Europe Region) model.

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